JPRS-UST-86-027

2 DECEMBER 1986

USSR Report

SCIENCE AND TECHNOLOGY POLICY

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USSR REPORT

SCIENCE AND TECHNOLOGY POLICY

CONTENTS

ORGANIZATION, PLANNING AND COORDINATION

PROFITABILITY OF SECTORIAL SCIENTIFIC RESEARCH INSTITUTES

Moscow SOVETSKAYA ROSSIYA in Russian 20 May 86 p 2

[Article by Corresponding Member of the USSR Academy of Sciences I. Nesterov, director of the West Siberian Scientific Research Institute of Exploration of Geology and Lenin Prize winner, under the rubric "What Is Hindering the Evaluation of the Efficiency of the Work of Sectorial Scientific Research Institutes According to the End Result": "A Fine for...Creativity"]

[Text] To start with there is the following question: Can a sectorial institute make a living? A well-informed person will answer: it can, but will not be able to. This is not a play on words, but the paradoxes of management. It "can," because the creative potential of many of our scientific collectives is sufficiently high. But it "will not be able to," because a large number of restricting documents will not allow this.

Let us begin with the fact that the majority of scientific themes, which are financed by the bank, are not connected directly with the end result. Having cited the requirements of the day--to work in accordance with goal programs, during the last five-year plan we attempted to get round the established procedure. We did not have the slightest success. We got the standard reply: the bank does not finance programs.

The 27th party congress demanded attention to be directed to the end results. I assure you that any institute can change over to such work without delays. It is only necessary that the ministry instead of themes would fix specific goal assignments, while the bank would finance them. These assignments should be large-scale: five or six per scientific research institute. For example, to develop a new technology or a system of machines, to substantiate the increase of mineral reserves.... And the ministry does not need to be petty and to assign the assignments to subassignments and subparagraphs. It is sufficient to set for the scientific research institute a specific goal and to specify the amount of allocations and the deadlines. While the themes are the internal affair of the scientific research institute itself and its scientific council.

The five-year plan, which is turned over by the institute to the bank, can then be fit onto one or two pages. We also attempted to turn over, strictly speaking, such a plan. The financiers openly laughed at the "crudely written

document" and forced us to write out everything by themes and to give substantiations, which they, not being specialists, can hardly understand. And here, in order to keep pace with the times and to work in accordance with goal programs, it is necessary to keep triple accounting: in the ministry to approve the programs, at the bank--the themes, but to work on our own goal assignments which are oriented toward the end results.

Assume for a moment that the bank has also been reorganized and finances goal assignments. Then scientists as if can be accepted for the introduction of their developments. But, it turns out, it is also better not to do this. Expenditures on such work are not envisaged in the estimate of the scientific research institute. This is inevitably punished by a fine. There was an instance at our scientific research institute. A staff member developed a new mechanism for a seismic station and received a medal of the Exhibition of National Economic Achievements, an inventor's certificate, a foreign patent, and...a fine of 700 rubles. What for? It turns out that the bank took care that a person invented not in accordance with that item, not in accordance with that source! It is possible, of course, to laugh. But go through the pages, for example, of the instructions of the USSR Ministry of Geology, which regulate the sources of financing in the area of geological prospecting. And you will see that this document prohibits the staff members of a sectorial scientific research institute to invent, research, and participate in the work of scientific councils--here it is no laughing matter....

I can also show instructions which prohibit scientists to introduce their own developments. It seems that financiers are convinced that this is the matter of production workers alone. But it was demonstrated long ago: if researchers and developers do not leave their creation to the mercy of fate, but act hand in hand with production workers, the cycle from the idea to the machine is shortened noticeably. Hence, it is also necessary to bring the procedure of financing in line with this idea, which has been verified by life.

How long the discussions on the reorganization of the management of sectorial science have been going on. But here is what is surprising: our financial stronghold is resisting in every way the wind of changes and is putting into effect an entire system of petty guardianship. Each source of financing is a minimum of 100 instructions.

Formally the scientific research institute is not prohibited a profit. But it is not easier for me, a director, because of this. It would be better for this profit not to exist at all. For if a scientific research institute, having gotten round all the instructions, all the same has an income, the ministry for the next year, acting according to the tried method of planning from what has been achieved, will relentlessly cut the amount of allocations and the wage fund by the amount of this very profit. Here one has to take evasive action: both to introduce developments and to conceal the profit so that the legions of inspectors would not guess its existence.

It is clear that these regulations have nothing in common with the orientation of science toward the end result and sooner lead away from it than draw closer to it. And in no way stimulate the desire of the institute to strive for

complete self-sufficiency and to replenish the national treasury with hard cash.

But not only the bank is preventing the scientific research institute from working for the end result and deriving profits. Its own hindrances are also no weaker. Because the psychology of production workers is being changed even more slowly than the numerous codes. I will relate how this happens at times. Scientists of our institute proposed a means of the optimum designing of exploratory wells. It makes it possible to shorten the time of the exploration of deposits and to reduce by one-fourth the number of wells which provide little information. The ministry ordered this method to be used throughout the country. But the majority of geologists prefer as before to direct attention not to the efficiency of exploration, but to the number of meters in case of the drilling of wells, and nearly forgot about the proposed means.

I will cite another example. Today by means of geophysical methods--the eyes and ears of geologists--it is possible directly from the surface to "feel" the structure of the depths. However, for the present only a tenth of the most abundant information, which has been extracted literally from under the ground, is being used. The main reason for such wastefulness in Western Siberia is the organizational isolation of geologists and geophysicists.

An idea arose: to establish from both at our scientific research institute scientific groups. Let them develop new means of the geological interpretation of geophysical data. No one objected to the idea. They recorded the corresponding paragraph in the measures of the main administration, which had been adopted for the implementation of the instructions and conclusions of M.A. Gorbachev in accordance with the results of his trip to Tyumen Oblast. But this, as they say, is on paper, but what is it in life? "We will not fulfill this paragraph," they said to us. "There is no need, they say, to split geophysicists up among various organizations and to violate the principle of specialization." The conclusions in favor of the advantage from the efficiency of the prospecting of minerals were not taken into account.

What is the reason here? I believe that it is the fact that the chief of the main administration does not need to evaluate the activity of his scientific research institutes according to the end results. It in general makes no difference to him, just as to both the ministry and the bank, what the sectorial scientific research institute will yield as a result--a profit or losses. For all the same the institute is carried on the state budget. On the other hand, no one repealed the string of restricting instructions. Whether you want to or not, it also has to observe these "keep out" signs.

Must it be said that given such a procedure of the management of sectorial science, when everything has been organized upside down, confusion also arises. It is not the job of the main administration, the ministry, and the bank to calculate scrupulously what intermediate operations have been performed and how much money was spent on them. The result of the work of the scientific research institute should become the main indicator for them.

The sectorial scientific research institute can and needs to emerge from the shoreless paper sea, orienting itself toward a single beacon: the end result. This is new methods of research and revolutionary technologies. And a profit, believe me, will not prevent the scientific research institute at all from actively engaging in science, but, on the contrary, will prompt it to intensive work.

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CSO: 1814/242

FACILITIES AND MANPOWER

DEVELOPMENTS, PLANS OF FAR EASTERN SCIENTIFIC CENTER

Moscow IZVESTIYA in Russian 24 Jul 86 p 2

[Interview with Academician Viktor Ivanovich Ilichev, chairman of the Presidium of the Far Eastern Scientific Center of the USSR Academy of Sciences, by IZVESTIYA correspondent for Maritime Kray and Sakhalin Oblast Yu. Balakirev (Vladivostok): "A Fresh View Is Needed. The Affairs and Concerns of the Far Eastern Scientific Center"; date and occasion not given; first paragraph is IZVESTIYA introduction]

[Text] IZVESTIYA's own correspondent for Maritime Kray and Sakhalin Oblast talks with Academician V.I. Ilichev, chairman of the Presidium of the Far Eastern Scientific Center of the USSR Academy of Sciences (DVNTs), about the role of science in the development of the eastern territories of the country.

[Question] Viktor Ivanovich, the "possessions" of the Far Eastern Scientific Center stretch from the foggy Komandorskiye Islands to the center of the Baykal-Amur Railway Line, from the Ussuri jungles to the Arctic ices. We have definitely lagged behind with the scientific support of the rapid development of the territory. Why? The most topical word of our days is reorganization. What does it mean for the Far Eastern Scientific Center?

[Answer] The question is difficult. On the one hand, our scientific center has to its account many studies which are working directly for the accomplishment of the tasks which were posed by the 27th party congress. Especially when it is a question of the study of the natural resources of the Far Eastern region and the ocean shelf. And at the same time you correctly state--the level of research and its organization as a whole for the present does not satisfy the requirements.

First of all a fresh view of the very structure of the center is probably needed. It is still not balanced with the rapid economic development of the region.

I will explain my thought. Until recently the Far Eastern Scientific Center was developed mainly as a center of the natural sciences. Earth science and the science of the ocean were its "whales." Now approximately half of the activity of its institutes is connected with the development of the world ocean. At the same time a number of directions, which are vitally necessary

in the sharp turn of science toward the needs of the national economy, have been passed over. I have in mind the directions which are connected with the development of mathematics, mechanics, and machine science--they are poorly represented today at the Far Eastern Center. But one must not delay any longer the development of the theoretical principles of fundamentally new types of equipment and technologies. We are already doing something. Specialists of the new Institute of Mining are increasing the reliability of equipment and machines and are developing resource-saving technologies. The collective of the Institute of Chemistry is dealing with the technology of protective coatings with preset properties. Laboratories for powder metallurgy and flexible machine systems have been established. But for the present a picture of the necessary scale is not taking shape from these individual examples.

That is, it is impossible to regard the formation of the Far Eastern Scientific Center as completed, although it has dragged on for three five-year plans. The Institute of Machine Building in Komsomolsk-na-Amure should be established more rapidly. This is disorder--to leave the industrial centers, where new sectors are being rapidly developed, without scientific subdivisions. The Far East is also the most suitable site for the Institute of the Complete Use of Raw Material Resources.

Reorganization is a broad, ambiguous concept. What can each scientific subdivision specifically contribute to acceleration already today, now? What is being passed over? When we met with the economic managers, we proposed our own thing and found out what had become urgent for them, it turned out that many reserves and interesting proposals had accumulated here.

[Question] From the proposal to introduction, as is known, the distance is at times of impermissible length. The fate of which developments of the scientific center for the national economy especially worries you from this point of view?

[Answer] Here is one such development. Under Maritime conditions potatoes are susceptible to viral diseases. Strains rapidly become obsolete. There even arose the opinion that this crop is unpromising for the kray. But the Institute of Biology and Soil Science proposed a method of developing seeds of nonviral potatoes and restoring the health of the strain. Demonstrating the promise of the idea, the scientists for 10 years developed a seed fund. Now the Urozhaynyy Specialized Seed Growing Sovkhoz is operating on the basis of the institute's experimental farm. There 160-180 quintals are being harvested per hectare given the usual 80-90 quintals for the kray. The durability of potatoes in case of storage is increased by 40 percent. The sovkhoz on the average derives annually a profit of 500,000 rubles. At the same time all these years the burden of cultivating seeds has fallen only on the academic institute, the collective of which is still being diverted for "patronage" operations.

There is another example. A special polymer film for hothouses was developed at the Institute of Chemistry. An industrial-scale experiment showed: under this film the harvest of cabbage increases by 50 percent, radishes, tomatoes, and cucumbers--by 25-40 percent. The technology of producing the miracle film

is not very complicated. It is secured by inventor's certificates. However, the production of the film in the Far East and, what is more, outside it is not managing to be set up.

For the present the relations of science with production are forming not entirely equitably. Scientists at times look like petitioners when they should be lawmakers. Enterprises depend on the good disposition of one manager or another.

[Question] Well, but what if you evaluate as a whole what remains lying on your "shelves"? What are the proportions of what has been and what has not been assimilated among your suggestions to the national economy?

[Answer] About 20 percent have been assimilated. But the reasons lie not only in the inertia of managers. They, after all, will take only the developments which, as they say, have been brought to the plant gates. While we at times are forced to offer results which have not undergone proper pilot experimental testing. It is our shortcoming and our misfortune: the scientific center does not have a base, by relying on which it is possible to bring our works up to the stage of production prototypes which are entirely ready for duplication. The plans of capital construction at the facilities of the Far Eastern Scientific Center have not been fulfilled since the first days of its formation.

[Question] The scientists of the center have drawn up a comprehensive goal program of regional development--the "Far East" Program. What are its goal and main ideas?

[Answer] This is an important stage in the biography of the center. We drew up a draft of the plan of the balanced socioeconomic development of the region. The recommendations of science are based on the analysis of 28 versions of the development of its productive forces to 2005. We are proceeding from the fact that the path to the solution of any regional problems begins in the social sphere. Proposals on the rapid creation of a higher standard of living of the people of the Far East have been included in the program. A labor-saving policy based on the latest equipment and technologies and advanced forms of the organization of labor is regarded as the leading principle.

Among the leading ideas of the program I will also single out the following one: it is impossible to link the creation of the material and technical base of the region only with the volumes of the extraction of natural resources. It is clear that it is profitable for ministries to get in the Far East raw materials, especially scarce and unique ones. But this leads to an increasing disproportion between the development of the extractive sectors and the overall economic development of the territory. While in the final analysis the state loses.

Let us take an example which is close to IZVESTIYA. During the precongress days the newspaper showed the chain reaction of the losses of the Dalpolimetall Association in Maritime Kray due to red tape with renovation and with the introduction of advanced technology. The enterprise sends lead

concentrates across two oceans, to the central regions of the country, but imports from them to the Far East metallic lead.

Let us go farther. At the Solnechnyy Mining and Ore Dressing Combine in Khabarovsk Kray less than half of the useful components are being taken from the excellent complex ore. Our descendants, who will have to process all over again the so-called tailing dumps, will learn the real value of today's loses. Meanwhile the expenditures on a chemical metallurgical works for the combine, according to the estimate of the Institute of Economic Research, would be recovered more than once over in just one five-year plan.

In the documents of the 27th party congress it is emphasized: it is necessary to change over to the thorough complete processing of raw materials locally. Thus, the "Far East" Program contains versions of the bringing of the "top floors" of production closer to the raw material base. We are substantiating the establishment in the region of our own plants of nonferrous metallurgy and the development of complexes for the thorough processing of timber, which include the production of fodder yeast, fiberboards, high-quality plywood, and so on. The intensification and comprehensiveness of the use of raw material resources locally, according to our calculations, are capable of increasing by two- to threefold their return to the national economy.

[Question] The Far Eastern region, at first glance, has today a substantial scientific potential. But does it correspond to the tasks which the 27th party congress posed for science with respect to the development of Siberia and the Far East?

[Answer] It does not. The coming stage of the development of the eastern territories requires of science a much greater contribution and a qualitatively new level. The scientific basis of the Maritime program and the "Intensification" Comprehensive Program is being developed here. The goal is to answer the urgent questions: How, by means of what initiatives and reserves is it possible to ensure the necessary pace of scientific and technical progress, how are the greatest results to be obtained with the minimum expenditures of labor?

I will also share the concerns of the Presidium of the Far Eastern Scientific Center. We lack highly skilled specialists, especially for the development of new technical directions. The turnover of personnel is intolerably high. This is connected with the less favorable conditions for life and creative scientific work as compared with other regions of the country. The construction of housing, dormitories, and children's institutions is lagging chronically. There are no dispensaries and holiday hotels as all. The hospital in Vladivostok has been under construction for 10 years.

Much here depends on the territorial organs and their attitude toward the requirements of the developing scientific center. But the very Presidium of the Far Eastern Scientific Center, nevertheless, also cannot afford allowances for "growing pains." The assurance in the Far East of a higher level of the intensification and industrialization of science as compared with the union indicators is on the agenda.

[Question] Is the coordination of the efforts of academic science, science of the higher educational institution, and sectorial sciences in the Far East effective enough?

[Answer] We have a coordinating council. But I cannot say that the situation is satisfactory. Coordination does not reduce, after all, to the passive combination of plans. But the council is not capable of influencing the ministries. Now we have agreed to the conclusion of contracts directly with the ministries and are setting up interdepartmental scientific engineering centers. One such center for the increase of the reliability of parts of agricultural machinery is being formed in Blagoveshchensk. The establishment of a base for oceanological instrument making is next. Apparently, we will find common ground with the scientific and working subdivisions of the Ministry of the Fish Industry.

The lag of the scientific research and pilot experimental base, which dragged on for many years and was recently noted at the CPSU Central Committee Plenum, could not but affect the pace of scientific and technical progress. For our center the establishment of a pilot experimental base is the most urgent task.

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CSO: 1814/239

ACTIVITY OF GENERAL PHYSICS, ASTRONOMY DEPARTMENT DETAILED

Moscow PRAVDA in Russian 9 Jul 86 p 3

[Article by A. Prokhorov, academician secretary of the General Physics and Astronomy Department of the USSR Academy of Sciences, under the rubric "The Horizons of Science": "From the Arsenal of Physics"]

[Text] It is now already generally acknowledged that the most substantial achievements, which are capable of sharply accelerating scientific and technical progress, are based first of all on the results of basic research. Therefore, when we physicists compare with our work the demand of the 27th party congress that each person at his place work with initiative and conscientiously in the name of the acceleration of the socioeconomic development of the country, first of all we direct attention precisely to this aspect of the activity of the scientific institutions of the General Physics and Astronomy Department of the USSR Academy of Sciences.

The range of their research encompasses such most important scientific directions as solid-state and semiconductor physics, quantum electronics and microelectronics, plasma physics and controlled thermonuclear fusion, optics and spectroscopy, acoustics and hydroacoustics, radiophysics and radio engineering, astronomy, radio astronomy, astrophysics, and space research. Their practical yield is being used in the implementation of the Food and Energy Programs, as well as programs, which are connected with physical and technical problems in the field of medicine and biology, and a large number of other scientific and technical comprehensive goal directions.

For further advancement we can rely on the substantial scientific reserve. It is capable of yielding an appreciable return in such a most important sector of the national economy as machine building. It is a question, in particular, of the development of new ceramic construction materials, which are obtained from available raw materials and increase the durability of parts by tens of fold.

The development of studies of amorphous and microcrystalline alloys, which have a unique combination of mechanical, electrical, and magnetic properties and high resistance to corrosion, will make it possible to use these alloys in transformers, which will decrease the losses here of electric power to one-tenth to one-fifth. They are capable of increasing by tenfold and more the

durability of magnetic recording heads. The studies of the processes of the growth of crystals promise the development of new materials for electronics, radio engineering, and optical and acoustic instruments.

The use of high pressures is putting its mark on advanced technologies. They are very effective, for example, in case of the synthesis of ultrahard and finely dispersed materials and make it possible to obtain large perfect diamonds. The hydrostatic pulse processing of construction materials increases labor productivity in the metal working industry by several fold and improves the service properties of items.

In short, the arsenal of modern physics is rich and diverse. But much still has to be done in order to introduce more rapidly in industry on the basis of basic research practical developments which are of great national economic importance. For this it is necessary not only to strengthen the material and technical base of our institutes, but also to act in a more purposeful and concerted manner.

As an experiment, which was aimed at speeding up the introduction of the results of research in the national economy, in 1981 temporary scientific and technical laboratories were established at eight scientific institutions of the USSR Academy of Sciences, including our department. The uniting within them of the efforts of collectives of the USSR Academy of Sciences, on the one hand, and enterprises of sectorial ministries, on the other, helped to reduce to one-third to two-thirds the time of the practical return of scientific research.

The very structure of the laboratories, which are established for no more than 3 years, the use of the experimental, production, material, and technical base of enterprises of the interested sectors, and the financing of the activity of the temporary laboratories at the expense of assets of the client organizations contributed to this. For example, the temporary laboratory "Problems of the Technology of Means of Communication" of the Institute of Solid-State Physics developed and turned over to enterprises of the sector the technology and prototypes of the equipment for the production of magnetic amorphous fine crystalline alloys, which surpass in magnetic properties by two- to threefold and in wear resistance by three- to fivefold the level achieved in the country.

Having become convinced of the advisability of cooperation of this sort with industry, during the new five-year plan we have already established at the institutes of the department 12 temporary scientific and technical laboratories. But life requires the further improvement of the organization of the scientific activity of the institutes of the USSR Academy of Sciences. It is necessary to develop more extensively the joint research of institutions of our department with institutes of other departments of the USSR Academy of Sciences, the academies of sciences of the union republics, and higher educational institutions, as well as with scientific institutions of industrial ministries and departments.

A list of the most important scientific and technical problems, with respect to which a good reserve exists for the acceleration of scientific and

technical progress, has now been prepared here. As an example I will point out two such directions. The first is the development of the use of lasers in medicine and technology. In recent years it has become clear that it is possible to treat very many diseases with lasers. There are also a large number of technological problems which it is possible to solve only with their use. Great prospects here are connected with the development at the Institute of General Physics of the USSR Academy of Sciences of solid-state lasers of a new generation with parameters which do not have analogues in world practice.

The other important direction is the development of fiber-optics communications. The institutes of our department actively participated and are continuing to participate in the development of the technology of obtaining fiber-optic lightguides of different types.

However, in a number of directions the scale and level of basic physics research in our country do not satisfy the present requirements. The further development of physics is being checked by the inadequacy of budget financing. Thus far they have poorly provided the institutes with modern scientific instruments, equipment, computer hardware, and automation equipment. It should be specially emphasized that the establishment under the leading institutes of powerful special design bureaus with a pilot works is necessary for the speeding up of the practical implementation of our developments.

We have difficulties and shortcomings, which are connected with the imperfection of the structure and the poor organization of work. For example, the establishment of affiliates and scientific centers of the USSR Academy of Sciences has weakened the direct relations of the department with institutes of the physics type, which belong to the affiliates and centers.

An unfavorable situation has formed with the rights and duties of the departments of the USSR Academy of Sciences, which, in my conviction, should become the basic structural subdivisions in the system of the Academy of Sciences, which bear responsibility for the development of the corresponding scientific directions in the country and at academic institutes. But such responsibility should be supported by specific rights. It is a matter of broadening the possibilities of the departments when settling questions of capital construction, financing (including special-purpose), and the staffing of scientific research, as well as in the planning of international relations.

It seems to me that the role of the departments can and should be much greater. It is impossible to encompass all science as a whole. But leading specialists in the corresponding scientific directions, who can formulate the most qualified decisions on the most important questions of the development of these scientific directions, are concentrated in the departments. It is also necessary to examine the question of the clearer distribution of duties among the structural subdivisions of the staff of the Presidium of the USSR Academy of Sciences, sections, and departments, having in mind the elimination of parallelism and the drawing up of documents.

For the successful activity of our institutes, in addition to adequate material and technical supply, efficient scientific administrative supervision is also needed. As experience shows, if the managers of institutions,

subdivisions, and scientific groups actively participate themselves in research work, "get worked up" about it, and know how to organize and to pose for young people and other staff members interesting, urgent tasks, science is also enriched by new achievements.

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CSO: 1814/238

ACCELERATOR COMPLEX OF INSTITUTE OF HIGH ENERGY PHYSICS

Moscow PRAVDA in Russian 18 Jul 86 p 3

[Article by PRAVDA special correspondent A. Pokrovskiy under the rubric "Report From a New Installation" (Protvino, Moscow Oblast): "Acceleration of the Accelerator"; first paragraph is PRAVDA introduction]

[Text] The U-70 charged particle accelerator, the most powerful one in the USSR, is in operation at the Institute of High Energy Physics. At the same time the construction of an even more imposing storage-accelerator complex with superconducting magnets is being carried out. Last year the U-70 as if began a new life: an intermediate ring accelerator (booster) together with its linear colleague was put into operation.

It is difficult for the nonspecialist to understand the complexities of the pipelines, which maintain the vacuum, the current-carrying busbars, and the magnets of this accelerator, which come back to life on command. And it is entirely impossible to imagine the mathematically calculated pattern of the invisible microwave fields, which with exquisite precision determine there, in the vacuum, the path of other invisible things--protons. And what is more, it is not easy for the specialist to do this.

In contrast to medicine the larger the tool used for atomic "microsurgery," the smaller the "operating field" is. The reason for this is entirely fundamental: it is possible to squeeze one's way farther and farther into the depths of the microcosm only by increasing the energy of the probe. Here the particle probes in the accelerators, which are lined circle after circle with the pulses of an electromagnetic field, are gaining it. And the more strongly we want to accelerate the particles, the more and more powerful installations have to be put into operation.

But before accelerating them, it is necessary to drive, to inject the particles into the cyclic accelerator. Accelerators of another type--linear accelerations--in which the particles move not in a circle, but in a straight line, are used for this. In this case the linear accelerator, which can also be used independently in atomic research, becomes the injector, the spring of charged particles. But in contrast to an ordinary river this stream up to the very "mouth" is no longer replenished by any tributaries. So that one of the

parameters essential for the further progress of experiments--the intensity of the particle flux--is defined precisely here.

Do not think that it is a question of some small attachment to an enormous structure. A person of average height can usually pass with ease through the pipeline of a linear accelerator, the design of which was proposed by Nobel Prize winner L. Alvarez. But a simple fact testifies to its technical level: for several decades now the accelerators of Alvarez have been used at all the atomic centers of the world without fundamental changes of the design. And now a linear accelerator of a new type has been proposed, designed, and built at the Institute of High Energy Physics. In combination with the booster it makes it possible to increase the intensity of the entire complex.

"What does the increase of the intensity of the beam of particles, which are being accelerated in the accelerator, mean?" says Professor L. Solovyev, director of the Institute of High Energy Physics. "If it increases by tenfold, the number of recorded nuclear 'events,' which interest researchers, also increases by tenfold. And, hence, their labor is intensified, if you wish, is accelerated. In other words, this is equivalent to the construction of another nine such accelerators. Not by chance did I name the figure '10'--the booster put into operation with the new linear accelerator, which was developed by a collective of staff members of our institute under the supervision of Doctor of Technical Sciences V. Teplyakov, can also increase the intensity of a beam of protons by precisely that many fold."

"Let us specify what the words 'new accelerator' mean," Vladimir Aleksandrovich said when we arrived with him at his "creation." "Usually in a linear accelerator the particles are maintained in the vicinity of the axis ('are focused') by a field of magnetic lenses. Their production is very labor-consuming. Focusing by the same high-frequency field, by which they are also accelerated, is used in the new installation. The very idea of using a high-frequency field for focusing is not new. Back in 1956 V. Vladimirskiy considered such a possibility and at the same time indicated the significant difficulties in its realization."

"But all the same we decided to try," V. Teplyakov continues the account. "We had opinions on how to surmount these difficulties. And now, when we have coped with the problem, I can confirm, its solution proved to be difficult. The calculators of the dynamics of the particles, who are headed by Candidate of Physical Mathematical Sciences A. Maltsev, had to rack their brains. Advanced high-speed computers were used for this purpose. The group of developers of the accelerating structure, which Candidate of Technical Sciences V. Stepanov manages, and the group of the systems of high-frequency power supply, of which another Maltsev--Ivan Grigoryevich, also a candidate of technical sciences, was in charge, had to take much trouble. The designing and construction of the accelerator, which was begun back in 1973, were carried out step by step, in parts. While its physical start-up within the entire complex was carried out just recently. Physicists are already now working with more intense beams of particles. I do not know, perhaps, this structure, as they say, 'does not look effective' to someone, but for us the new accelerator is very precious. For everything was made by our own hands, at the experimental production base of the institute."

In dealings Vladimir Aleksandrovich is a gentle, considerate person. And very obstinate in the solution of scientific and technical problems. There were enough skeptics at all the stages. And even when the theoretical studies of microwave fields, which afforded the possibility of their simultaneous use both for acceleration and for focusing, were completed, the voices of opponents were heard.

"Is it worth beginning the construction? The old one has already been checked out well, while it is still unknown how the novice will behave."

But the management of the institute actively supported the project. Thus the "Teplyakov accelerator" was born.

Before becoming acquainted with the new machine, we visited the hall in which the old linear accelerator is. And it was immediately obvious how much more compact and smaller in its dimensions the novice, which was situated in a very modest building, is.

"And significantly more economical in production," Vladimir Aleksandrovich added. "Incidentally, the old linear accelerator has also not been left without work. We are setting up on it the production of radioactive isotopes for medicine."

The accelerator complex so far has not achieved full capacity. The period of its technical adjustment, so that it could do the work of 10, still lies ahead. But it is already clear that the specialists of the Institute of High Energy Physics have taken a substantial step in the fulfillment of the task which was posed in the Basic Directions for the 12th Five-Year Plan: "To develop...elementary particle, nuclear, and solid-state physics, microelectronics and quantum electronics and optics, radiophysics, as well as research in the field of atomic and thermonuclear energy...."

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CSO: 1814/239

PROBLEMS AT POLTAVEMALKHIMMASH PRODUCTION ASSOCIATION

Moscow PRAVDA in Russian 7 Jul 86 p 3

[Article by PRAVDA special correspondent A. Tarasov under the rubric "In the Wake of a Letter": "The Reflex Worked"]

[Text] I had not had time to return to the editorial office, when a warning letter arrived from Poltava. A. Yakubov advised the authorities on how to protect me against errors when investigating this case. Since when meeting with him I found Anatoliy Mikhaylovich writing complaints about preceding investigators, I understood what awaited me, if by chance I "made a mistake."

But here is what happened. At the Poltavemalkhimmash Production Association on the order of the USSR Minister of Chemical and Petroleum Machine Building they halted the production of a small reactor which is known by the name of a vortex vessel. More precisely, they did not halt it entirely, but sharply curtailed it, having left something only for laboratory purposes. Only 7 vessels were included in the 1987 plan--after 256, for example, in 1984. The term of effect of the specifications for production was discontinued by this order this year.

Well, does no one need the unit anymore? On the contrary, the institute is literally swamped with orders of enterprises and institutes of Moscow, Kaluga, the Urals, Siberia, the Ukraine.... They beg, demand, send couriers--it is useless. Following the order 200 petitioners were rejected.

But first let us return to the beginning of the 1960's, when at one of the Ural plants the young engineer D. Logvinenko engaged in earnest (if in his free time) in the study of the working capacities of a magnetic field. He properly read the scientific literature, built a homemade unit out of a small electric motor, and became convinced that the vortex magnetic field, which was created in it, can speed up various processes. He began to try grinding and mixing and to improve the design--as a result the author's application originated, and then a certificate of authorship for the invention--"A Reactor for Carrying Out Processes in a Fluidized Bed"--was received.

The Poltava NIIemalkhimmash, to which Logvinenko came to work, took an interest in the unit. A special laboratory, then a department were

established there. Cooperation with a number of institutes and more than 200 enterprises and organizations of various sectors and departments was begun.

I will cite the expert opinion of prominent scientists. At that time Academicians of the Ukrainian SSR Academy of Sciences F. Ovcharenko, V. Trefilov, and I. Frantsevich and Corresponding Member of the USSR Academy of Sciences V. Kafarov wrote to the chairman of the USSR State Committee for Science and Technology: "The introduction of such units makes it possible to speed up by hundreds and even thousands of fold several technological processes in the chemical, petrochemical, pulp and paper, mining chemistry, microbiological, electronic, and other sectors of industry, to reduce the consumption of electric power per unit of output to one-fiftieth to one-tenth, to decrease sharply the necessary production areas, and to increase labor productivity and product quality." This is far from the only appraisal of this sort.

Logvinenko stands up, bending with difficulty his leg, which was shot through during the war. He takes me to look at the machine. Here it is, a burst of ferromagnetic particles which pulsate in a powerful magnetic field. In fractions of a second they also speed up reactions.

Short, reserved, ascetically thin, in the words of colleagues and fellow employees, carried away to self-oblivion by the work, which it is possible to call the theme of his entire life, Logvinenko is a proper, but direct person. And he is "uncomfortable" for this. At the moment of the decision of the fate of his creation he is capable of saying even to a minister: "Allow me not to agree with you," and to cause by this a snowballing rebuke. He also wrote bitter lines to the editorial office: "In my letter it will be a question of matters which are entirely inexplicable from the standpoint of common sense--about how the series production of new chemical units is being hastily eliminated to please a single person, who is ignorant about equipment, but has become an expert at writing 'warnings'"....

The annoying thing here lies not even in the disrupted triumphal procession of promising units. The annoying thing is that the triumph is as if on the outside, while on the inside there are many years of enormous work. For to develop all the technological processes, to decrease the consumption of ferromagnetic particles, to prevent their escape--all these are important design problems. A large number of them arose, and all of them were solved more or less successfully.

It is possible to regard this as natural difficulties of introduction, which require greater attention to the unit. But it is also possible to speculate, throwing such lessons, especially the initial ones, which are 10 years old, like ashes into the eyes.

In the lengthy monologue of the opponent, A. Yakubov, I heard a large number of the same expressions, in which his letters, which were addressed to many instances, abound along with an abundance of grammatical errors. "Sharp swindlers"--thus he calls the specialists who developed the unit, accusing

them of all mortal sins, in which there are "plagiarism," "bribery," "insolence," "self-advertisement," "forgeries," "escapade," and so on and so forth.

Somewhere at the end of the account it appears that for the purpose of "rescuing" the compromised unit he, Yakubov, submitted a proposal, but it, of course, was "killed" by the "sharp fellows."

So that is it! The picture turned out to be simple. Yakubov actually did submit a proposal and wanted to become a coauthor of the infamous "swindler specialists." But the proposal was, to put it mildly, unconvincing and did not arouse the enthusiasm of anyone, including neutral experts. Coauthorship did not take place. But retribution did take place.

At one time A. Yakubov worked as secretary of the Poltava Oblast Party Committee. Then he became deputy director of this very institute, at which they were developing the vortex vessels. Then the collective and party organization tearfully begged to rid them of this scientific supervision. Deliverance occurred, but it cost the institute a decade of continuous checks against the complaints of Yakubov.

Having experience in conducting paperwork, using each time the names of responsible officials, with whom he was personally acquainted, and without mincing his words, the "opponent," as we see, achieved much.

There are, you know, unsolved riddles. In the Poltava Oblast Committee of the Communist Party of the Ukraine, in the union ministry, at the institute, and in the rayon party committee no one said to me a bad word about the unit after many investigations. Especially about Logvinenko. But no, the unit is not that bad and, perhaps, is even good, but Yakubov had painfully tormented them with slanders. And there is actually a reason--here at the neighboring plant of synthetic diamonds they rejected the unit, here at the plant of motor vehicle assemblies they turned it off....

And this information on the refusal of the neighboring plants was included in the official test report and was sent to Moscow, to the Party Control Committee attached to the CPSU Central Committee.

This is already more than a riddle. Because at the plant of synthetic diamonds I found an efficiently operating and even very necessary, in the opinion of specialists, unit. At the plant of motor vehicle assemblies it is more difficult--there two units have actually been turned off. The reason is simple as can be. "They require an increased standard of service," the operators of the unit courteously explained, "operators of a high category. But here the 'aunties' are not very competent, therefore, we are coping with the old system. Here are two pits, over there are the chemical reagent tanks, we pour them from a hose and mix them"....

Through the irony of fate the interdepartmental industrial tests of the unit, which should have given a final response to the complaints of Yakubov, took place at this plant of motor vehicle assemblies. The certificate of the tests states: "The unit is efficient and ensures a higher degree of purification of

the waste water of the electroplating shop as compared with the operating technology. The use of the unit...ensures a saving of chemical reagents."

Chemical reagents are not crumbs. If you gathered them up around the country, it is a question, for example, of tens of thousands of tons of ferrous sulfate a year.

But instead of an accelerating pulse the retarding reflex came into action. A truly Solomonian decision was made by the ministry. Although after these tests there were no real complaints about the unit, all the same...seek them, by examining the entire stock of units which are already operating in the country. Moreover, by the forces of the reduced and weakened institute department, which would work much more fruitfully on their improvement in case of inclusion in the plan. But production was halted--it is much safer to slow down than to speed up. But what are those, who need the units very much, to do?

I telephone Kaluga. There they received a rejection to the application to produce the unit for the treatment facilities of the Gigant Production Association. In the design and technological bureau they explain to me in anxious voices that the performance of the units has been checked in similar processes of other enterprises and that there is no substitute for them. Today this is the most effective means of purification, while in the future this arrangement will be introduced at 17 match enterprises, for which several tens of vortex vessels will be needed.

"But what if you do not receive the machine?"

"It is hard to believe this," A. Vekshin, chief of the design and technological bureau, says. "The renovation of the treatment facilities will be upset, sludge from the works will enter the Oka."

The Gorkiy State Trust of Sanitary Engineering Construction, which is interceding for "its own" treatment plants of chemically contaminated discharges, which are under construction and were designed on the basis of vortex vessels, was turned down.

"We will have to seek other means, which are less effective, and to postpone for a year or two the issuing of the already finished designs," deputy chief engineer V. Kashitsin says and concludes just as the people of Kaluga: "The plants are appealing to us, the sanitation and epidemiological stations are closing them. And we appeal to you: help!"

Meanwhile the flow of Yakubov's complaints reached the walls of the USSR State Committee for Inventions and Discoveries. And the same committee, which had included the inventor's certificate for the designs of similar units and processes with their application in the list of the most important ones, which are recommended for introduction, "corrected" its oversight. For some reason the proposal "from above" to check the letter of the same Yakubov was interpreted unambiguously: satisfy his complaints. The magnetic field has been used for decades in many inventions. But due to the coincidence of several words the inventor's certificate of Logvinenko was revoked.

"What is one to do now?" I asked G. Samokhvalov, chief of the group of experts, who chaired that meeting. "There is a unit which with respect to all its parameters was actually developed for the first time. No one denies this. And the unit does not have an inventor. What has become of him?"

The logic of the response was as follows: if the steam engine had been known in weaving, while wheels had been known in the making of a wagon, it is necessary to deny the inventor of the locomotive an inventor's certificate for the reason of the lack of novelty.

A pure "out of harm's way" approach. And even an indecently hastened one. But this hastening is already nothing of the kind. Just as, incidentally, all the convolutions which are by no means replacing if only one vortex vessel.

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CSO: 1814/238

ANNUAL GENERAL ASSEMBLY OF MOLDAVIAN SSR ACADEMY OF SCIENCES

Kishinev SOVETSKAYA MOLDAVIYA in Russian 25 Apr 86 p 2

[Article by ATEM correspondents V. Malikova and R. Khomenko: "At the Turning Line. From the Annual General Assembly of the Moldavian SSR Academy of Sciences"]

[Text] The 12th Five-Year Plan should become the turning line for science of Moldavia. As an accelerator of the pace of scientific and technical progress in the republic it has to make a vigorous turn toward the needs of the retooling of the national economy, the improvement of social relations, and the achievement of profound changes in the sphere of labor and in the material and spiritual conditions of the life of people. Here for the Academy of Sciences as a whole the main goal is to ensure the leading development of basic research, having increased its technical orientation, to identify fundamentally new means of scientific and technical progress, and to create the scientific prerequisites for their realization. Much has to be done for the proper determination of the priority directions, the increase of the coordinating role of the academy, and the improvement of relations with production. The Annual General Assembly of the Moldavian SSR Academy of Sciences aimed scientists at this.

The reports of the president of the Moldavian SSR Academy of Sciences, its Academician A.A. Zhuchenko, on the results of the 11th Five-Year Plan and the tasks of the republic Academy of Sciences for the 12th Five-Year Plan in light of the decisions of the 27th CPSU Congress and the 16th Moldavian CP Congress and of the chief scientific secretary of the Presidium of the Moldavian SSR Academy of Sciences, its Academician A.M. Andriyesh, on the activity of the academy in 1985 were discussed.

It was noted that the increase in the republic of the role of basic science in the accomplishment of the most important national economic tasks contributed to the introduction during the past five-year plan of more than 800 new technologies, materials, and instruments, which is twofold more than during the preceding five-year plan. The economic impact increased in this case by threefold, having amounted to more than 350 million rubles. Last year more than 250 developments were introduced, scientists fulfilled 268 economic contracts. A definite contribution was made to the solution of the problems of fuel and power complex and the Food Program, to environmental protection

and the efficient use of natural resources, to the introduction of electronics in the national economy, and to the development of advanced technologies and new materials.

During the current 5-year period first of all the basic research, which contributes to the greatest degree to the accomplishment of specific practical national economic tasks and ensures truly revolutionary changes in equipment and technologies, should undergo priority development. Particular attention is being devoted to science-intensive technical works and the establishment of scientific centers for microelectronics and optoelectronics, electrophysical methods of machining metals, and others.

Scientists are called upon to make their own contribution to the acceleration of the growth rate of labor productivity and to the increase of production efficiency by means of new machines and technologies, computer hardware and robotic devices, flexible automated lines, and control systems.

The questions of complete mechanization in fruit, grape, vegetable, and tobacco growing, which will decrease the need of the State Agroindustrial Committee for seasonal workers, especially during the periods of the harvesting of crops, need special attention of scientific institutions. Since precisely these sectors are the basis of the production specialization of the republic and their role will increase more and more, the problem of complete mechanization in them should be solved as quickly as possible.

Here it was emphasized that the orientation of research toward the solution of the most important national economic problems presumes not only the increase of the integration of the academic, sectorial, and plant sectors of science, but also the greater division of labor among them. For it is no secret that at many academic institutes the duplication, moreover, in far from the best execution, of operations of sectorial scientific research institutes occurs. Therefore, the problem of increasing the influence of academic science on the pace of scientific and technical progress can be solved only on the condition of the significant increase of the level of its fundamentality.

The influence of basic science on the acceleration of the pace of scientific and technical progress in the national economy will prove to be most effective only in case of a comprehensive approach to the solution of the problems in the area of the development of industry, agriculture, and the use of natural resources. In connection with the diversion between basins of the waters of the Danube for the irrigation of the southern and central rayons of the republic the need is arising for the drafting of a plan of the water resource balance of Moldavia, which would guarantee the supply of agricultural lands with moisture and the economical consumption of water, the prevention of the erosion, salinization, and waterlogging of soils. Here the joint efforts of scientists of various specializations will be needed. Here their scientific searches, first of all in basic research, should lead substantially reclamation designing and especially construction. Much attention is being devoted to the formulation of a republicwide long-range program of the protection, complete use, and reproduction of resources of the environment. But it encompasses all aspects of the efficient use of nature.

It is planned to expand research in such an important direction as the development of the biological principles of the adaptive intensification of agricultural production. It is well known that at present sectorial institutes annually regionalize tens of new strains and propose many new technologies. More and more equipment, fertilizers, and pesticides are being supplied to agriculture, and given all this it is not managing to ensure the steady increase of its productivity and, consequently, to eliminate the urgency of the food problem, it was noted in the report and statements. Therefore, scientists see a priority need for the elaboration of fundamentally new solutions in the area of breeding, land management, plant protection, agricultural technology, the synthesis and use of biologically active substances, the designing of ecologically stable agricultural ecosystems, and the improvement of the methods of obtaining information on the climate, soils, and the state of plantings. The accomplishment of precisely these tasks will make it possible to raise research at sectorial institutes to a qualitatively new level and to ensure in the end the stable increase of the productivity of agricultural production, its economy of resources, and nature conservation.

A number of steps, which are aimed at the improvement of the mechanisms of the assimilation and use of scientific achievements, have been taken in Moldavia. Councils for the promotion of the acceleration of scientific and technical progress have been established under the Central Committee, city committees, and rayon committees of the Communist Party of the republic. The work that has now been launched on the establishment of interbranch scientific technical complexes, which are called upon to become an important unit in the system of the formation of a unified organizational and economic mechanism of this acceleration, is of fundamental importance.

The implementation of the technical policy of the CPSU requires the radical improvement of the established interrelations between science and production, particularly with respect to the question of the introduction of technical innovations. Their practical use is delayed at times for years. A development becomes obsolete before it gets a start in life. It is absolutely clear that topicality, fundamental novelty, and technological feasibility are the main condition of its introduction. It is natural that most often jobs, which have not been submitted for approval to clients and have been performed without consideration of their requirements, are left on the shelves to gather dust. In order to correct the situation, already this year departments of introduction are being established at each institute of the natural science type, a department of the introduction and promotion of scientific achievements is being organized under the presidium of the academy.

The contribution of social scientists has to be increased for the acceleration of the socioeconomic and spiritual development of society. The themes and results of their work frequently are far from well-reasoned, specific recommendations on the improvement of matters in the national economy and culture. At times they are performed at a low ideological and theoretical level, it was stated at the assembly. At the present stage the transition from the statement of socioeconomic problems, which predominates for the present, to the forecasting of social processes and trends and the elaboration of recommendations for practical activity is necessary.

The times require of scientists of the academy that they respond sensitively to changes in life and new phenomena, analyze them, and draw conclusions which correctly orient experienced workers. In this connection the task of writing fundamental works, in which topical problems of social development would find coverage, is being posed. Among them are such ones as the improvement of administration and the mechanism of management, the development of class and national relations, the creativity and initiative of the masses, and the change of the consciousness of man.

Developing the thesis of the role of basic science as a "base of knowledge" and the formation of a "base of its application," A.A. Zhuchenko stressed that even in exclusively theoretical research the possible areas and means of the practical application of the obtained results should be indicated without fail.

The readers of the reports and the speakers, and these are the academician secretaries of the departments, executives, and leading scientists of various scientific subdivisions, noted that the provision of the institutes with an experimental and production base and the establishment in each of them of narrowly specialized design bureaus and pilot works are the most important condition of the rapid introduction of such jobs. During the 12th Five-Year Plan 49 million rubles have been allocated for these purposes. With allowance made for the attracted assets of ministries and departments for the development of the material base it is planned to assimilate 73 million rubles. Here it is planned to put into operation a geophysical observatory, an institute of physiology and biochemistry and an institute of microbiology, a design bureau of biological instrument making, a building of pilot-scale plants of the Institute of Chemistry, and other facilities. By means of the cooperation of the assets of ministries and departments it is also planned to build a pilot experimental enterprise of robotics and machine building, electrical devices and instruments of power engineering, a geological engineering testing ground, and much more.

With the establishment at the academy of an automation and metrology center not only was the collective use of expensive equipment ensured, but the implementation of major programs on the automation of scientific research and the establishment of problem-oriented information measuring complexes was begun. At the end of last year the first stage of the collective-use computer system, which is oriented toward the automation of scientific research, was put into pilot operation. The establishment of a unified academywide system made it possible to eliminate the inevitable parallelism in the developments of autonomous complexes, to increase the efficiency of the use of single-design scientific equipment and computer hardware, and to ensure the pursuit of a unified scientific and technical policy in this area. The implementation of a standard multifunctional system of the integrated automation of scientific research, which includes the gathering and processing of the results of measurements, the management of the experiment, and the retrieval and gathering of scientific and technical information, is planned during the current five-year plan.

At the assembly it was stated that the relations of academic institutes with higher educational institutions, schools, and vocational and technical schools

should be strengthened and improved for the attraction to science of talented young people. The practice of establishing affiliates of chairs at institutions of the academy and of base chairs of higher educational institutions at enterprises has to be expanded in every possible way, leading scientists have to be actively involved in giving lectures for student youth.

Among the vital tasks are the radical improvement of the style and methods of work of each scientific institution and its subdivisions and the creation of a creative atmosphere of scientific research and the increase of the efficiency of scientific labor and the responsibility for the end results and for the rapid and large-scale implementation of scientific results.

The scientific reports of Academician of the Moldavian SSR Academy of Sciences D.V. Gitsu on semiconductor physics and of Corresponding Member of the Moldavian SSR Academy of Sciences G.N. Singur on the socioeconomic problems of the development of the Moldavian SSR under the conditions of intensification were heard.

First Secretary of the Moldavian CP Central Committee S.K. Grossu delivered a speech at the General Assembly of the Moldavian SSR Academy of Sciences.

The election of the president of the Moldavian SSR Academy of Sciences was held. Academician of the Moldavian SSR Academy of Sciences A.A. Zhuchenko was reelected as him.

S.F. Izmaylov, a responsible official of the CPSU Central Committee, and Deputy Chairman of the Moldavian SSR Council of Ministers N.P. Kiriyak took part in the work of the assembly.

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CSO: 1814/242

BIOLOGICAL METHODS OF CONVERTING SOLAR ENERGY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 20 Apr 86 p 4

[Interview with Doctor of Chemical Sciences Sergey Dmitriyevich Varfolomeyev, winner of the USSR State Prize, by V. Lagovskiy: "Living Energy"; date, place, and occasion not given; first two paragraphs are SOTSIALISTICHESKAYA INDUSTRIYA introduction]

[Text] All the electric power plants of the world in thousands of years would not generate as much energy as the sun sends to the earth in just a day. Alas, people for the present are only drawing buckets from this shoreless ocean.

Our interview today with Doctor of Chemical Sciences S. Varfolomeyev, a USSR State Prize winner, concerns biological methods of the conversion of solar energy.

[Question] Sergey Dmitriyevich, when sending an ordinary log to the stove, now hardly anyone thinks about the fact that he is lighting at his place a small sun. For wood is a product of photosynthesis, an organic compound which has absorbed the energy of our luminary, just as coal, petroleum, and gas. In short, in burning organic fuels, man has used for a long time now and actively biological methods of the conversion of solar energy. Is it worth inventing new ones? Is it not easier simply to heat with biomass, which on earth, according to the most modest calculations, annually increases in weight by 100 billion tons?

[Answer] Such plans are also being examined quite earnestly. But how is one to gather the necessary quantity of plants without detriment to nature? It is a different matter when the conversation turns to the waste products of agriculture--here doubts do not arise. But before burning waste products, specialists propose to convert them into more ideal types of fuel. Present methods are now capable of obtaining gas, alcohol, and even gasoline from plants. In Brazil, for example, they annually produce from sugar cane and the waste products of the sugar industry nearly 4 billion liters of ethanol and use it as a gasoline additive. While in China the gas obtained from the waste products of agriculture is now already meeting 30 percent of the needs of the country for energy.

But it is not enough just to recover waste products--in order to use the truly global and inexhaustible source, it is necessary to cultivate biomass specially. And such attempts exist. The Scottish are building a thermoelectric power plant, which will run exclusively on firewood made of poplar, which grows quite rapidly. But in this case as well one will have to rely only on the will of nature, on natural growth. But its pace is far from ideal. Man can increase it by tens and even hundreds of fold. And it is here that the new biological methods of converting solar energy begin.

[Question] But their essence remains the same: the conversion of biomass, which has been grown by means of the sun, into fuel....

[Answer] Of course, we are not rejecting natural processes, which take place in living nature, but are merely raising them to a new qualitative level. For example, if specific conditions are created for microscopic marine algae, they will gain weight much more rapidly than all terrestrial plants. In the coastal zones of deserts it is possible to establish entire plantations of them and to obtain per hectare up to 100 tons of biomass a year. Just 1 square kilometer of solar plantations could supply a small city with energy. While if some part of the "plantings" is allotted to edible mussels, this city will also be supplied with food. Such a farm will yield up to 30 tons of pure protein per hectare.

It is possible to feed the mussels phytoplankton from the energy plantations and subsurface water which is rich in mineral substances. The expenditures on its pumping will be recovered with interest. For the difference of the temperatures at the surface and in the deep is an additional source of energy. Calculations show that the plantations, which are located on only a thousandth of the area of the tropical zone, will supply the entire world with energy and protein.

[Question] Hence, will one have to go to the tropics for energy?

[Answer] Not necessarily, and in our country there are plenty of suitable sites--the Caspian Sea, the Aral Sea. In all 8 square kilometers of a smooth surface of water are capable of satiating with energy such a city as Frunze or Yerevan. While the Aral Sea alone would be enough for the entire country....

Bacteria convert biomass into fuel. It turned out that it is also possible to force them to work more rapidly and productively. Theoretically, if you increased the temperature, fermentation into fuel will take place more rapidly. But in practice it also ends rapidly--the microscopic workers perish in a hot environment. But recently in the boiling water of Kamchatka springs we detected and singled out microorganisms, which are capable of rapidly multiplying at a high temperature and of liberating hydrogen in so doing. Today the methods of genetic engineering are making it possible on their basis to engineer bacteria which will produce in a hot environment both methane and alcohol. While at a temperature of 80 degrees it is possible to drive it off immediately from the reactor, bypassing the complex processes of cleaning and filtration.

[Question] But how does hydrogen itself, which these bacteria could liberate, not suit scientists? For it is an energy-intensive and ecologically clean fuel.

[Answer] For hydrogen it is necessary to reorganize power engineering substantially, while for methane or alcohol it is practically not necessary. Of course, we are also pondering over the future, moreover, here at Moscow State University original biological methods of producing hydrogen already exist. One of them is so-called biophotolysis--a process which is akin to electrolysis. Its task is the same--to decompose water into hydrogen and oxygen, but only by means of the energy of the sun. And it is possible to assign this work to living organisms.

Imagine long rows of bioenergetic reactors which go beyond the horizon. Special photosynthesizing bacteria float in some. "Basking" in the sun, they liberate oxygen from the water and produce energy-intensive compounds. In the other reactors anaerobic bacteria decompose them into hydrogen and carbon dioxide. The hydrogen is sent to a storehouse, while the carbon dioxide is sent again to the first reactor.

This project is by no means a dream. Today all the prerequisites already exist to ponder in earnest the establishment of industrial plants. In our opinion, in precisely such systems it is possible to convert solar energy most completely. For microorganisms are obliged to natural enzymes for their ability to decompose water to hydrogen and oxygen. Our colleagues--the biotechnologists--are now engineering microorganisms with "improved" enzymes, which will be able to work more actively and reliably.

[Question] Sergey Dmitriyevich, but is it impossible to do entirely without bacteria and to use enzymes alone?

[Answer] It is possible. They are trying to deposit enzymes on synthetic films, to pass water between them, and thereby to decompose it. But such a method is suitable rather for studying the "productivity" of organic compounds, the dynamics, chemistry, and biophysics of processes. While in industry artificial systems will hardly be better than living ones, which reproduce themselves.

[Question] Recently amazing bacteria, which are capable when exposed to light of generating electricity immediately, were recently discovered. Might they become at some time the basis of solar electric power plants?

[Answer] It is difficult now to predict this. Scientists have just begun the research--they have figured out the mechanism of the formation of electric charges in the living cell. But for the present it is not clear how to draw them from microscopic membranes and how to collect them. I believe that the use of such bacteria affords different prospects: perhaps, they will become elements of the memory of computers of the future--biocomputers.

In short, there are many ideas, plans, and developments, but their technological embodiment is lagging. We know that the reserves of fossil fuels are not unlimited, but we can change our own psychology. It is time to

realize that solar energy is not an exotic thing, that sooner or later it will be necessary to deal in earnest with renewable energy sources. Is it not better to do so sooner?

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CSO: 1814/241

MINIATURE LIQUID ORGANIC DYE LASER

Minsk SOVETSKAYA BELORUSSIYA in Russian 26 Mar 86 p 1

[Article by BELTA correspondent G. Novikov for SOVETSKAYA BELORUSSIYA under the rubric "Science in Working Order" (Minsk): "A Laser...in the Pocket"; first paragraph is SOVETSKAYA BELORUSSIYA introduction]

[Text] The liquid organic dye laser, which was developed by Belorussian physicists, does not have analogues with respect to the majority of characteristics.

It might have been thought that the venerable scientist had decided to pull the journalist's leg:

"It is not very much like a laser.... Now you will be convinced yourself," he said and put a hand into the pocket of his jacket. "Do not smile, I am actually looking for the instrument--before the meeting I specially took it. Here it is."

Corresponding Member of the republic Academy of Sciences A. Rubinov, chief of a laboratory of the Institute of Physics of the Belorussian SSR Academy of Sciences, found what interested me. He carefully puts the miniature part on the end of his finger.

"This little one is also our new laser. You can feast your eyes...."

"Here is the title of a future report--'A Finger Tip Laser'," I noted.

"This is not entirely precise. It would be more correct to write 'A Laser in the Palm.' You are seeing a 'semifinished product.' Various mountings and attachments are needed so that it could work. But in completely assembled form it will also easily fit in the palm."

In the Laboratory of Laser Spectroscopy of Minsk Pedagogical Institute, where the innovation was developed under the supervision of A. Rubinov, some scientific associates are preparing the next instrument, others with the dexterity of Leskov's Left-Handed Smith are beginning to make the next miniature instrument.

"The design of the so-called ros-laser is simple," Candidate of Physical Mathematical Sciences A. Dasko explains. "There is a minimum of parts: a metal cell, a holographic grid, a mirror, and several lenses--this is about one-twentieth as many as the simplest analogue. It is possible to make it not only in plant shops, but also under laboratory conditions. It is natural that such a simple attachment is also inexpensive. I will not even specify the price--for instruments of such a class the figure is incredibly small. I will say one thing--so far no one has yet made such small, simple, and inexpensive instruments. No, with respect to the majority of parameters the 'kid' is not inferior to the 'older brothers.' If we speak about one of the basic qualities of such instruments--the precision of the wavelength, ours is small and daring--it significantly surpasses them. In this sense for the present it is too early to call it the standard, but it is safe to say that it is close to the standard."

Senior scientific associate S. Ryzhechkin anchors the little one among the other optical measuring instruments and fills it with a solution of liquid organic dye, which is bright like aniline.

And now the laser came back to life and cast a beam, which is invisible under natural light and concentrated a luminescent yellow spot on the laboratory wall. It breathes like a sunspot. This "breathing" is due to light pulses which last millionths of a second.

The basic purpose of the innovation is spectroscopy. The first models of the instrument, which was developed by the people of Minsk, have already been turned over to the scientists of the Institute of Spectroscopy of the USSR Academy of Sciences--there they have installed microlasers on the most sensitive spectrometers today, which are capable of detecting minute impurities in various substances--solid, liquid, gaseous.

"They will count atoms under field conditions," S. Ryzhechkin jokes and explains: "The instrument of the Muscovites is unique, but for the present has a substantial drawback--it is very bulky. Our development will make it possible to replace large and complex lasers with a miniature one and to give up computers and complex electronics, which set for the lasers the necessary parameters. The complex will immediately become compact, vibrations will not be terrifying to it. After such modification it is possible to use it in the field, in the plant shop, and on board an oceanographic ship. This will make it possible to detect in a large amount of matter the presence of even one or two 'extraneous' atoms."

"We are proposing," A. Rubinov says, "that our laser will find the most extensive application both in science and in industry. The first introduction--on a high-precision spectrometer itself--demonstrates that the kid 'was found suitable' for researchers. Where else it is possible to use it? For example, for the monitoring of the cleanness of the environment. They will be glad of such an instrument at plants which produce integrated microcircuits--there the slightest contamination appreciably affects product quality. It will find application without fail in such sectors as geology, biology, and medicine. I even cannot bring myself to limit the list of possible spheres, in which one cannot do without the little laser."

While we were speaking--not more than an hour--scientific associates I. Vabishchevich and N. Golikova completed the work on the parts of the next minilaser. While half of this time was enough for them to assemble the instrument. I was not going to wait for the results of the next experiment--the "bouquet" of possibilities of the new laser, which had just been "presented" by the scientists, was convincing enough to draw the conclusion--the innovation has a great future.

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CSO: 1814/241

MATERIALS FOR AUTOMATIC LASER UNITS IN PRINTING INDUSTRY

Moscow PRAVDA in Russian 16 Jul 86 p 3

[Article by Candidate of Technical Sciences V. Filin, chief of the Laboratory of Photoreproduction Processes and Materials of the All-Union Scientific Research Institute of the Printing Industry, and Candidate of Chemical Sciences T. Bityurina, senior scientific associate: "When Will the Line Approach? Automatic Laser Units for the Printing Industry"; first paragraph is PRAVDA introduction]

[Text] In December of last year the article of V. Gavrilchik, chief engineer of the Baranovichi Consolidated Printing Plant of the Belorussian SSR State Committee for Publishing Houses, Printing Plants, and the Book Trade, "Lasers and the Printing Industry," was published in PRAVDA. Since that time more than half a year has passed--a quite sufficient period not only to outline specific measures on the speeding up of the pace of the introduction of laser technology, but also to take practical steps on the implementation of this unquestionable achievement of scientific and technical progress. However, no headway has been made. It distresses us to speak about this especially as our laboratory bears responsibility for laser themes.

Let us explain the essence of the problem. In order to produce on an automatic laser unit an offset printing plate, two things are necessary: the automatic unit itself and plate materials. As to the latter, special master plates for automatic laser units have been series produced since 1984 at the pilot experimental works of the All-Union Scientific Research Institute of the Printing Industry. At present the All-Union Scientific Research Institute of the Printing Industry has developed new materials, which make it possible to shorten the time of the production of plates on an automatic laser unit to one-third to one-half, and has developed silverless films for the obtaining of negatives and positives, which makes it possible in a number of cases to abandon the use of expensive and very scarce photographic materials.

Several themes on the development of new plate and film materials, which are sensitive to laser radiation, have been planned at the institute for the 12th Five-Year Plan.

Not only printing industry workers, but also organizations of other departments are displaying an interest in them. The use of these materials

promises a large economic impact and will help to increase product quality and to speed up technological processes in the printing industry, cartography, and the electronics industry.

The basic obstacle to the extensive introduction of laser technology is the lack of the necessary equipment: automatic laser units. As a result of many years of work of scientists of the USSR Ministry of the Electronics Industry such automatic units have been developed and have been series produced since 1980. Six are being used in the printing industry. For example, a laser section for the production of printing plates for the publication of local and large-circulation newspapers has been operating successfully for 4 years now at the Podolsk Interrayon Factory of Offset Printing. Some experience has been gained, it has been shown that the use of laser technology makes it possible to shorten by 2.5 hours the time of the publication of one issue of a newspaper and to decrease by 55 percent the expenditures on its publication. Unfortunately, the experience has not found extensive dissemination due to the lack of automatic units, and more precisely, due to the departmental position of the Ministry of the Electronics Industry, which does not want to "cut in" the printing industry workers.

It would seem that the most reasonable, state approach to the matter is for the Ministry of the Electronics Industry to ensure the production of automatic units not only for itself, but also for the country as a whole, and for the USSR State Committee for Publishing Houses, Printing Plants, and the Book Trade to meet the need of all interested enterprises for materials. For the present a "half-court" gain is being played: the All-Union Scientific Research Institute of the Printing Industry is supplying with master plates all the departments which have automatic laser units. At the same time due to the lack of automatic units the institute cannot speed up the work on the development of film materials, since it will be impossible to use them in the printing industry. Meanwhile numerous requests on the allocation of films are arriving at the institute from organizations and enterprises of other sectors, which have automatic laser units, and first of all from enterprises of the Ministry of the Electronics Industry. Now at these enterprises they are forced to expose, develop, and use for laser recording scarce, expensive technical photographic film, while the materials, which were developed by the institute, are several fold less expensive.

We do not consider advisable the assimilation of the production of laser equipment at enterprises at the Ministry of Machine Building for Light and Food Industry and Household Appliances, as V. Gavrilchik proposed, since this would drag out the extensive introduction of laser technology in the national economy for long years (this department would have to begin much over again). The most reasonable solution, in our opinion, is to increase the volume of automatic laser units, which are now being series produced, at the enterprise of the Ministry of the Electronics Industry. In turn the institute could increase the output of materials and supply interested organizations with them.

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CSO: 1814/241

COOPERATION OF SOVIET, POLISH SCIENTISTS

Moscow PRAVDA in Russian 6 Jun 86 p 4

[Article by PRAVDA corresponding O. Losoto: "Jointly With Colleagues. Cooperation of Soviet and Polish Scientists"]

[Text] Warsaw, June--The 26th floor of the Palace of Culture and Science. A broad panorama of Warsaw unfolds beyond the windows.

We are in the office of Scientific Secretary of the Polish Academy of Sciences Zdzislaw Kaczmarek. He is a well-known Polish scientist, a specialist in the field of hydrology and water resources. For several years now he has been in charge of the "headquarters" of Polish science.

Our conversation concerns the cooperation of Soviet and Polish scientists. In the decisions of the 27th CPSU Congress and in the materials for the coming 10th PZPR Congress much attention is devoted to socioeconomic transformations on the basis of scientific and technical progress, the active interaction of the fraternal countries, and their coordinated scientific and technical policy. Scientists and scientific organizations have to solve important problems.

"The modern world," Z. Kaczmarek says, "has entered a new stage of the scientific and technical revolution. The scale of the problems, the solution of which we are undertaking, does not have equals in history, whether this concerns production processes or living conditions and the development of the human personality. The 27th congress of the Soviet communists, just as the congresses of the other fraternal parties, shows vividly that socialist cooperation is worthily satisfying the demands of the times and is indicating new prospects to mankind. The key to the solution of the problems facing us is science and scientific and technical progress in the national economy. Life urgently requires the reevaluation of many fixed views, habits, and skills. Science should become an immediate productive force and should increase its role in the solution of such problems of the present as the improvement of the educational system, health care, the supply of mankind with food, and environmental protection.

"The Polish People's Republic is gradually overcoming the consequences of the socioeconomic crisis of the late 1970's and early 1980's. Many design and

technological problems are being efficiently solved in the country, which is necessary for the normal functioning of industry. This has made it possible in recent years to increase labor productivity, to decrease the expenditures of power and raw materials per unit of national income, and to withstand the discriminatory economic restrictions on the part of several capitalist states.

"However, the influence of science on the development of Poland is still inadequate. The draft of the PZPR Program poses for our scientific forces new tasks, which follow first of all from the fact that the growth of the national economy to 2000 will be accomplished first of all by the increase of production efficiency.

"This is a common problem of the entire community of socialist states. With enormous attention Polish scientists acquainted themselves with the documents of the 27th CPSU Congress, especially that part of them, which concerns the role of science and technology in the Soviet Union. At the held precongress conference of communists at the Polish Academy of Sciences attention was directed to the unity of the approaches of our fraternal parties to the increase of the role of science in the development of socialist society.

"The countries of the socialist community are making coordinated efforts which are aimed at the acceleration of scientific and technical progress. This found its vivid expression in the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, which was signed in December 1985, as well as in many other joint measures. The Polish Academy of Sciences will fully implement the coordinated plan of actions.

"I want to direct attention to another problem. The CPSU and the PZPR are subordinating all their activity to the interests of the struggle for peace and to concern about a peaceful future of the planet. Enormous responsibility rests in this connection on the scientists of our countries. By joint actions in the ranks of the movement of scientists for the preservation of peace we will strengthen the forces and trends in international life, which are opposed to the threat of the annihilation of life on earth. The Congress of Figures of Science and Culture in Defense of a Peaceful Future of the Planet was held several months ago in Warsaw. The Polish and Soviet scientists, who took part in it, made a definite contribution to the development of the position of the congress on this key issue for the future.

"A special commission for studies of the problems of peace, to which our prominent scientists belong, has been established under the Polish Academy of Sciences. We are actively supporting the Soviet peace initiatives which are aimed at the complete elimination of nuclear weapons on earth by the end of this century. By numerous proposals the Soviet Union has invariably confirmed its sincere aspiration to secure peace on the planet."

Z. Kaczmarek touches upon the questions of the recently held 3d Congress of Polish Science and tells about the long-range priority directions of the development of the scientific and technical thought of Poland.

"It should be stated frankly," he notes, "that in recent years science in our country along with achievements has also had many difficulties. We have

maintained the proper pace not in all fields of modern knowledge. The economic crisis of the 1970's and 1980's adversely affected the level of financial investments in scientific research and the provision of institutes and educational institutions with modern equipment. In 1980 and 1981 the antisocialist forces repeatedly attempted to upset the research process and to severe the relations between scientists and the authorities. At the congress we spoke openly and sincerely about all these questions. It should be emphasized with all force that the bulk of Polish scientists are closely linked with the fate and problems of socialist Poland and wish to actively aid its flourishing. The 3d congress was held under the slogan 'Science in the Service of the People.'

"In discussing the directions of the scientific policy of Poland to 2000, the congress was guided by the long-term prospect of development of the country, which was outlined in the draft of the PZPR Program. We realize that the extensive sources of economic growth will soon be exhausted. The strengthening of the national economy, the further growth of the national income, and the increase of the living standard of the people are impossible without the decisive increase of the role of science. Therefore, in formulating the main directions of science for the next 10-15 years, we are attaching particular importance to the fields which serve the improvement of production processes and structural changes in industry. As an example I will indicate the work on new materials and the research, which is contributing to the decrease of the power-output ratio of the national economy, to the development of electronics, and to the automation and robotization of production. We are attaching great importance to biotechnology and its application in agriculture and industry. The 3d Congress of Polish Science came out in favor of the preservation of the proper proportions between applied and basic research. Without the proper level of biology, chemistry, physics, and mathematics it is also impossible to think about technology of the future. The Polish Academy of Sciences bears special responsibility for the proper programming of this research, as well as for the introduction of its results in economic practice. We are also devoting much attention to the social sciences as an important theoretical base of the building of socialism, as a tool of the formation of the consciousness and personality of the modern Pole. We are devoting more attention to research which contributes to socialist economic integration."

Concluding the conversation, the scientific secretary dwells on the cooperation of the Polish Academy of Sciences and the USSR Academy of Sciences.

"It is obvious," Z. Kaczmarek says, "that science in Poland cannot be developed in isolation, out of touch with research thought abroad, without the sharing of experience and knowledge. Scientific cooperation among the fraternal countries is of a more profound nature and is based on the joint solution of different problems, the socialist division of labor, and mutual assistance. The assistance of Soviet scientists was for us especially significant and valuable during the first postwar years, when science was revived together with the entire country.

"The scientists of the Polish Academy of Sciences for many years have maintained close fraternal relations with their colleagues from the USSR Academy of Sciences. We appreciate this cooperation, which is yielding both parties obvious advantages. For 1986-1990 we plan to carry out the joint elaboration of nearly 200 research themes, to convene conferences and summer schools, and to share experience. More than 500 Polish scientists annually go to scientific institutions of the USSR Academy of Sciences and the same number of Soviet scientists come to Poland. Nearly all the institutes of the Polish Academy of Sciences are linked by various forms of cooperation with Soviet science. We are also participating in the implementation of a number of research programs jointly with scientists of all the socialist countries. An example of such cooperation is the Interkosmos Program.

"The present international situation and the intensifying antisocialist campaign on the part of the imperialist centers of the West have created the need for the broadening of joint efforts in the sphere of the ideological struggle and the intensification of cooperation in the area of the social sciences. The Polish-Soviet commission for questions of cooperation in the area of the social sciences and the joint theoretical conferences, which have been organized by it and have been devoted to the key problems of the building of socialism, as well as to the criticism of anti-Marxist concepts of the development of socialism, are playing an important role here.

"In speaking about the cooperation of the Polish Academy of Sciences with the USSR Academy of Sciences, it is impossible to ignore joint research, its connection with economic practice and technical progress, the publication of Polish-Soviet monographs, and the participation of both academies in the implementation of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000. I am confident that, by uniting forces, henceforth we will also successfully accomplish the important tasks which face today the Polish Academy of Sciences and the USSR Academy of Sciences."

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CSO: 1814/242

DEVELOPMENT, USE OF GEORGIAN SCIENTIFIC POTENTIAL

Tbilisi ZARYA VOSTOKA in Russian 6 Jun 86 p 2

[Article by Academician of the Georgian SSR Academy of Sciences Emil Sekhniashvili, academician secretary of the Georgian SSR Academy of Sciences, under the rubric "The Criterion of Reorganization Is Acceleration": "Academic and Departmental Science. Is It Necessary to Separate Them?"; first paragraph is ZARYA VOSTOKA introduction]

[Text] The 27th party congress is posing the task of the more efficient use of the scientific and technical potential. Such a statement of the question sounds very urgent today. Society, while investing considerable assets in the development of science and technology, has the right to demand of scientists and economists the proper economic and social return, more active participation, and the creation of the material and technical base of communist society.

Science of Georgia now has a large scientific potential, which it is possible to use efficiently and which we should develop skillfully. More attention should be devoted to basic research, the fame of the Georgian mathematics, physiology, linguistics, psychology, and other schools should be supported and increased, the research in the social sciences, the humanities, and especially the technical sciences should be intensified. The bringing of the scientific potential into action will make it possible on a broad front to solve urgent national economic problems, including resource-saving problems.

The necessity of resource conservation and its great possibilities follow from the structure of the expenditures on the production of industrial output. If all the expenditures are taken to be 100 percent, in all industry of the country, according to the data of the USSR Central Statistical Administration, the expenditures on raw materials and basic and auxiliary materials come to about 67 percent, while on fuel and energy--only 6 percent. In our republic these expenditures are equal respectively to 74 and 4 percent. For the country in construction and installation work the expenditures on materials exceed 50 percent, in the construction materials industry the expenditures on raw materials and basic and auxiliary materials come to about 44 percent. In our republic they come to more than 48 percent, for fuel and energy--respectively about 11 and 9 percent. From these data it is evident how urgent theoretical research, which is aimed at the decrease of the materials-output

ratio, especially the metal content of machine tools and equipment, units and components, items and parts, and other types of industrial products, and at profound developments on the improvement of technologies, the creation and use of new economical materials, and so on, is. For the decrease of the expenditures on raw materials and materials just in industry of the Georgian SSR can yield in a year an economic impact of 75-80 million rubles. It is worth pondering over these figures in earnest.

It is well known that during the current period of industrialization, technicization, and collectivization it is impossible by a high level of the intellectual potential alone to achieve in practice appreciably gains in science, and especially in the applied and technical fields of science. Therefore, the availability of a material research and technical base, which is equipped at a modern level, is an urgent necessity for the increase of the efficiency of science and its intensification. Academic science and the institutes and organizations of the republic Academy of Sciences especially need this.

The backwardness of the material research base of the Georgian Academy of Sciences is explained not only by the lack of proper attention to the development of science over a lengthy period, when they preferred the extensive means of development, but also by the fact that a large part of the fixed capital of the Academy of Sciences both as a whole and in the active portion was physically and morally amortized long ago. Being carried on the republic budget and due to its limited possibilities, the Academy of Sciences for long years did not receive adequate allocations for the development of a material research base which satisfies the requirements of the day, and, although in recent years a drastic change in this respect has been made, here we are still far from the necessary level.

Along with this, several tens of scientific research institutes, technological design and planning organizations, scientific production associations, and affiliates and subdivisions of Moscow or other scientific research institutes and design bureaus, which are subordinate to union ministries and departments and which, as a rule, are furnished with advanced research equipment and have a good material research base, operate in the republic. However, the majority of them do not have the necessary theoretical base. Such a situation suggests the idea of the advisability of the combination of the intellectual potential of academic science and the material and technical potential of sectors and departments and, thereby, of an outlet of academic science into the sphere of physical production and into practice.

The concentration in republics of the supervision of science in the hands of one person, namely in the hands of the Presidium of the Academy of Sciences, it seems, is a practicable and the only means. This not only will properly increase the role of the Academy of Sciences as the coordinator of all scientific research work, since all sources of the financing of science will be concentrated in its presidium, but will also make it possible to combine fully the intellectual potential of academic science with the scientific and technical potential and the material research base of sectorial (departmental) science, to obtain a full return from science as a whole (without a division into academic and departmental science), and to carry out conversion in the

shortest possible time along the search--basic research--applied research (development)--planning and design development--sphere of physical production (the end result at the works) chain.

In this case the ministries, sectors, and departments, in performing the role of the clients of scientific research operations, will have to turn over to the presidium of the academy the financing which is being allocated to them for the maintenance of "their own" scientific research institutes and design bureaus. On its part the Academy of Sciences, in performing the role of the contractor and the filler of the orders of industry, construction, agriculture, and so on for research operations, which the corresponding sector or department needs, should bear full responsibility for the theoretical and practical level of the performed work and its readiness for immediate use in practice. Obviously, exceptions should be made only for a few sectors of the national economy, under whose direct subordination several scientific research institutes and design and technological bureaus should be left. Another component of the scientific potential--the organization of science and its management--will thereby be identified.

In speaking about the intellectual potential, we, as a rule, are using the figures on the number of academicians and corresponding members, professors and doctors of sciences, the network of scientific research institutes and institutions, and so on. And in so doing we somehow forget that the personality of the scientist and specialist is the main productive force, the vehicle of the intellectual potential. Man, the human factor, to which the party in recent times has devoting special attention, in science, perhaps, as in no other area of human activity, plays the decisive role. Therefore, when evaluating the intellectual potential not simply the total number of individual scientists and the intellect of each of them, but the optimum combination of these intellectual forces is of paramount importance. Previously these questions were never so urgent as now. And for this reason the need has now arisen for the establishment in the republic of a recognized scientific research institute for the science of science and sociology. The sector with the same name, which was organized under the Presidium of the Georgian SSR Academy of Science, showed, on the one hand, the correctness of this step and its topicality and, on the other, the inadequacy and weakness of a small scientific subdivision for the solution of the numerous and many-sided problems which are connected with the intensification of science and the increase of its efficiency. There are actually very many problems. Take, for example, such an important question as the reinforcement of science with young personnel. For our republic this problem has also remained urgent to this day.

It has been repeatedly noted: in recent times the "aging" of scientists has occurred. The analysis, which was made by the Sector of the Science of Science and Sociology attached to the Presidium of the Georgian Academy of Sciences, showed that, starting in the 1970's, a decrease of both the absolute number and the percentage of scientists under the age of 40 has been occurring, but, at the same time, the number of scientists 40-50 years old and older has been increasing. Such a picture is observed not only in the system of our academy, but also in sectorial science and science of the higher educational institutions of the republic as a whole. Since the second half of

the 1960's, in the system of our academy there has been no doctor of sciences under the age of 30, at present there are only two doctors of sciences under the age of 40. To what does this testify? To the extremely low influx of fresh forces into science. At one time, at the 6th Georgian CP Central Committee Plenum, the suggestion to comprehensively assist capable young people to show their worth and to give a good account of themselves in science as early as possible was brought up. Unfortunately, in the period that has passed since the plenum it has never been possible to create favorable conditions for the accomplishment of the posed task. Moreover, it is possible to say that the situation here has now become even worse.

As is known, graduate studies are the main means of entrance into science and the reinforcement of its ranks with young people. There are many positive and negative aspects in this form. Two forms of instruction in graduate studies exist: with leave (full-time) and without leave (correspondence) from production.

Since 1965 the number of graduate students at the Georgian Academy of Sciences has nearly not changed, it is stable and fluctuates within the range of 400. The annual admission comes to 120-130 people. Before 1965 in graduate studies of the academy the ratio of the places of full-time and correspondence graduate studies came to two to one. This is also understandable, since it should be taken into account that at the academy there are positive conditions (the great competence of the scientific supervisor, modern and advanced scientific methods and a base, extensive scientific information, and others) for the training of scientists. However, in recent years the situation has changed drastically, at present we admit to full-time graduate studies only one-third of the total number of graduate students.

Another negative thing is the fact that in recent years the graduate studies places in the natural and technical sciences have not been utilized. Thus, during 1981-1985 in the physical mathematical sciences applications were not submitted at all for 5 of the announced places in full-time graduate studies and for 13 in correspondence graduate studies. The situation is even worse in the technical sciences, in which applications were not received respectively for 10 and 34 places. Of course, we do not lose the allotted places. At the request of the Academy of Sciences the Georgian SSR State Committee for Science and Technology is making changes in the plan by means of the redistribution of the places: people, who displayed when taking the examinations for graduate studies a good knowledge and got high passing scores in humanities subjects, are being accepted for the places which, for example, have been allotted for natural science and technical subjects. However, it is clear that such one-sided reinforcement will not contribute to the acceleration of scientific and technical progress in the republic. Moreover, in those fields, which first of all govern scientific and technical progress, selection by competition has actually been eliminated, and, consequently, the identification of the best candidates is thereby being complicated.

There are many causes of the formed situation. They should be investigated in detail and thoroughly in order to outline specific steps and to fulfill them in practice. One thing is indisputable--the work with future scientists must be started already with the school and be continued at higher educational

institutions. And in this respect the Academy of Sciences and scientists of the republic can do much. The plan of the CPSU Central Committee "The Basic Directions of the Reform of Higher and Secondary Specialized Education in the Country" offers a clear program of actions in the area of the training of highly skilled personnel, including personnel for science.

The policy of the party in the area of the development of scientific and technical progress, which was specified by the April (1985) CPSU Central Committee Plenum and the 27th CPSU Congress, is aimed at the creation of favorable conditions for the dynamic progress of all fields of knowledge and the concentration of personnel and material resources in the most promising directions. In this connection the solution of the problems of the management of science seems especially important. The acceleration of scientific research, the increase of the creative return of researchers, and the effectiveness of the fundamental reform, on the path of which all the units of the economy of the country have embarked, depend on efficient, purposeful work in this most important sphere.

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CSO: 1814/242

AWARDS AND PRIZES

LASER PROCESSING OF FILM ELEMENTS FOR ELECTRONIC INSTRUMENTS

Moscow PRAVDA in Russian 7 Jun 86 p 2

[Article by Academician K. Valiyev, winner of the Lenin Prize, and Academician A. Prokhorov, Hero of Socialist Labor and winner of the Lenin Prize, State Prize, and Nobel Prize, under the rubric "For the USSR State Prize": "Lasers in Action"]

[Text] Before our eyes lasers have turned from exotic sources of light into a powerful means of the acceleration of scientific and technical progress. Laser technology, which makes it possible to develop fundamentally new processes of machining and ensures a multifold increase of labor productivity with a decrease of defective output, an increase of the precision of items, and the improvement of working conditions, holds a special place. This technology has already proven its viability in the processes of miniature welding and the heat treatment of parts and tools.

In recent years comprehensive studies of the precision possibilities of the laser method have been conducted. The effect of such radiation on the thin-film layers of integrated circuits and microelectronic instruments was studied in the process of detailed physics research. It turned out that with the use of a laser it is possible also to improve significantly this very fine, most "exquisite" technology.

During the past 5-year period the large-series production of automated laser equipment with its extensive introduction in industry was assimilated. The processing of film elements should be regarded as the basic achievement in the application of lasers in recent years. The work "The Establishment of the Scientific Principles of the Technology, the Development of Automated Equipment, and the Extensive Introduction of the Laser Processing of Film Elements in the Production of Electronic Instruments," which was carried out in collaboration with the higher school, the electronics and a number of instrument making sectors, is being nominated quite validly for the USSR State Prize.

It should be noted that this work has world priority. The basic principles of the laser processing of films were formulated in the USSR several years earlier than abroad.

The research required many years of intense labor of scientists and specialists. As a result six models of lasers with short pulses of radiation of two types--solid-state and gas--were developed, and then assimilated in series production.

This research and development were the basis for the new technology. Five functional banks, which include more than 20 types of laser units of the EM, Kvarts, Gibrid, Temp, AMTs series, by means of which the most important problems of the processing of film elements were solved, were developed. Among them are the adjustment and production of the masks of large-scale and very large-scale integrated circuits; the functional adjustment of such most complex integrated circuits as multidigit digital-to-analog and analog-to-digital converters, operational amplifiers; the adjustment of quartz piezoelectric elements and film micromodules, and so forth. The precision of adjustment operations in this case is increased by fifteen- to one hundredfold, labor productivity is increased by seven- to fifteenfold, the yield of acceptable elements is increased by 1.3- to 2-fold.

With the use of laser methods of the production, processing, and adjustment of film elements a large step forward was made in the increase of the degree of integration of microcircuits.

The new technical solutions, which were used in the units, are protected by tens of inventor's certificates and foreign patents. The units have been awarded medals of the Exhibition of USSR National Economic Achievements, have received a high rating of specialists, and are in demand abroad. It is gratifying to note that several units appeared in our country several years earlier than abroad, their series production has been organized.

An indisputable merit of the set of studies consists in much organizational and technical work in industry, which concluded with the large-series production and introduction of technological equipment in the leading sectors. Now it is being used efficiently at hundreds of enterprises of the country, yielding an economic impact of more than 100 million rubles a year.

Laser technology in our country continues to be developed rapidly, yielding more and more appreciable results in production and showing a vivid example of the rapid introduction of scientific achievements in practice.

The submitted work is an example of the successful introduction of the latest technological processes in production.

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CSO: 1814/241

CRYOGENIC TREATMENT OF MALIGNANT TUMORS

Moscow MOSCOW NEWS in English No 7, 23 Feb-2 Mar 86 p 10

[Article by Valentina Samoilova: "Cold Destroys Malignant Growths"; first paragraph is MOSCOW NEWS introduction]

[Text] A team of medics and engineers of Moscow, Kiev and Warsaw was, in 1985, awarded the USSR State Prize for designing techniques and equipment to break up malignant growths with the aid of very low temperatures, and for introducing them into wide clinical use.

Within Reach of Ordinary Doctors

The idea for using cold to destroy biological tissues had been around for some time before it was implemented in the 1960's once the required equipment had become available. Operations performed using cold caused a medical sensation. On many occasions cold proved to be much more effective than the usual surgical knife. But the results achieved could not find wide application in oncology mainly because there were no scientifically based precedents for such operations. It was unknown, for example, at what rate various tissues should be cooled and to what extent, how the cryoinstrument should be applied, how long it should remain in contact with the tumour, etc. The task was to bring the unique cold-assisted operations within reach of ordinary doctors, not surgeons alone. Finally, this was successfully done by Soviet and Polish experts. It had required thousands of various experiments on animals to discover the interdependence between parameters of cooling and the sizes of the dead tissue zones to be frozen. Represented in the shape of formulas and charts, the findings make it possible to determine in advance the required modes of cooling and the expected destruction of the tumour. This is very important because oncological operations had always to be performed with a safety margin by eliminating healthy cells around the tumour to prevent relapses.

Cryogenic Equipment Instead of Surgical Knife

An aim of the operations using cold is to destroy cancerous cells. To do that, a cryoinstrument with temperatures of minus 180^{o}-190^{o} C is brought close to the tumour. The freezing time in a single cycle varies between two and ten minutes. Then the frozen area can be warmed naturally from the warmth of

healthy tissues and by using a special appliance. Cold treatment in a few days produces a zone of dead tissue which gradually dissolves and gets rejected. For instance, the scar formed on animal liver where cancerous growths had been treated by cold is so small that it's difficult to detect after a year's time. Cold is a good painkiller, and patients usually need no special preparation before cold treatment. Patients who cannot be treated in any other way stand up well to partial cooling, and as a rule, the procedure is bloodless because tumours are removed not with a knife but by freezing. Using special nozzles that come together with the cryogenic equipment, it is possible to reach tumours located in the hard to reach parts of the different organs, like in the larynx, for example. Thus painful surgery can be avoided.

Cryogenic treatment involves two kinds of equipment. The hand-held equipment consists of small, comparatively light vessels containing a liquefied gas to ensure the necessary very low temperature at the nozzle. It's mainly used for breaking up small tumours. Large tumours are treated using heavy equipment where freezing operations can be monitored.

Minimal Damage

Treatment by cold has proven very effective in cases of lip cancer. It eliminates the need for irradiation of the tumour, its surgical removal and the consequent cosmetic surgery. Another example is treatment of malignant growths on the eyelid. The usual irradiation calls for a reliable protection of the eye against the possibility of partial or total loss of sight. But the best of protection, unfortunately, is no full guarantee against long or chronic inflammations and other troubles. Besides, these operations involve a high degree of risk and demand consummate skills from the surgeon. Cold, in fact, can destroy tumours without damaging the eye. Cryogenic equipment can also be employed for radical treatment of some other tumours in the area of the head and neck, and does much less harm to the patient's looks and psyche than surgical operations. There is also the possibility of treatment on an outpatient basis. It has been found that recuperatory processes in tissues are more effective after treatment by cold than by any other means.

Treatment by cold, which is being successfully used for various oncological diseases in the USSR and Poland, is now being tried out on bone tissue tumours, growths on the liver, on the pancreas and other organs.

CSO: 1814/220

WORLD SOIL MAP NOMINATED FOR USSR STATE PRIZE

Moscow PRAVDA in Russian 14 Jul 86 p 7

[Article by Academician Ye. Mishustin and Academician of the Turkmen SSR Academy of Sciences N. Nechayeva under the rubric "For the USSR State Prize": "The Land of All Continents"]

[Text] Soil science as a scientific discipline has its origin in V.V. Dokuchayev, whose works serve as a vivid example of the spontaneous and at the same time thorough penetration of the dialectics of nature, which is characteristic of the creative work of all great naturalists, the classics of natural science. They revealed not only the external spatial relations between the types of soils and the landscapes, but also the internal nature, the "hidden" mechanism of these relations. The first world cartographic compendium in the history of soil science--"Skhema pochvennykh zon Severnogo polushariya" [A Diagram of the Soil Zones of the Northern Hemisphere]--was one of the heights achieved by V.V. Dokuchayev. At the International Exposition in Paris in 1899 it was awarded a gold medal.

After the Great October Socialist Revolution USSR soil scientists continued and developed the works of V.V. Dokuchayev. Responding to the demands of agriculture, they developed a series of soil maps of different scale of our country. The new soil map of the entire world, which was included in the series of works "The Soils of the World: Genesis, Cartography, Resources, Assimilation," was a logical development and conclusion of this work. Here in essence for the first time such a complete inventory of the soil resources was made, an evaluation of all the diversity of soils of the world was made.

In the process of creating the soil map and on its basis a theory of the genesis and geography of soils was developed and problems of world soil classification were solved.

Quantity is developing into quality. The soil map of the world became not simply a scientific compendium, but a work which is of enormous importance. It is helping to solve on the scale of any territory and the world as a whole the problem of the commitment to production of new lands and to reliably take stock of potential land resources, as well as is affording possibilities of the exchange of production know-how among different countries--for only in case of the competent comparison of natural conditions it is possible to

transfer the know-how and technology of farming of some countries and regions to others. It is making it possible to give rapid information on the different degree of fertility of lands and on the occurrence of saline, solonetzic, eroded, waterlogged, and desert soils.

The informative nature of the map is increased by the explanatory works of the cycle in the form of monographs and articles, in which a detailed description of soils and landscapes, as well as recommendations on their use are given. The thorough analysis of the mechanical, mineralogical, and chemical composition of soils and the biological, physical, physical mechanical, chemical, and genetic properties in different regions and zones and on different continents made it possible to establish their agricultural importance and role in the biosphere.

It is possible to illustrate the latter by many examples. In the damp tropics the processes of weathering and soil formation occur extremely rapidly. The soils in 3-4 years lose their nutrients as a result of their carrying away by heavy precipitation. The complete felling of forests in the Himalayas entailed the most severe erosion and catastrophic floods in Pakistan, India, and Bangladesh. Something similar occurred in Indonesia and Brazil.

The soils of deserts conceal another danger. Farming here requires mandatory irrigation. However, it should be based on thorough knowledge of the properties of the soils here, otherwise their secondary salinization and degradation are inevitable. That is what happened in case of the development of irrigated tracts in North America and Europe. History knows even of the downfall and collapse of ancient civilizations on the Indian Subcontinent, in northern Africa, and in the valleys of the Tigris and Euphrates, of which disrespect and the forgetting of the role and importance of the soils were the primary source. In the temperate zone mistakes in the use of lands lead to the loss of humus and the sharp decrease of the fertility of soils. A campaign for the preservation of the fertility of black soils has been launched extensively in the USSR.

In the described series of works soils are regarded as one of the main resources of nature. The authors convincingly demonstrate that the importance of the natural productive forces of soils is no less than the forces of the mineral resources of the earth. For they feed mankind. They considered in detail the quantities of different soils throughout the world: by continents, zones, and regions.

As a whole on the planet only 1.5 billion of the 2.5 billion hectares that are potentially suitable for tillage are being used today in farming. All this convincingly shows the great sociopolitical importance of the scientific assumptions and facts of the series, which has been nominated for the USSR State Prize.

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CSO: 1814/239

NOMINEES FOR SECOND ROUND OF COMPETITION FOR KOMSOMOL PRIZES

Moscow KOMSOMOLSKAYA PRAVDA in Russian 9 Jul 86 p 2

[Article: "From the Commission of the All-Union Komsomol Central Committee for Leninist Komsomol Prizes in Science and Technology. A List of Works Which Have Been Allowed by the Commission of the All-Union Komsomol Central Committee to Take Part in the Second Round of the Competition for the 1986 Leninist Komsomol Prizes in Science and Technology"]

[Text] The Commission of the All-Union Komsomol Central Committee for Leninist Komsomol Prizes in Science and Technology has examined 155 works, which were submitted for the 1986 prizes and were completed by young scientists and specialists, instructors of higher educational institutions, graduate students, and workers. In accordance with the conclusions of the expert groups the commission has allowed 63 works in science and technology to take part in the second round of the competition.

In publishing the list of works, the commission addresses to scientists and specialists, to executives of scientific and scientific and technical societies, scientific institutions, enterprises, and higher educational institutions, as well as to executives of party, Komsomol, and other public organizations the request to send their opinions and remarks, as well as the materials of public discussion to the commission by 15 September 1986 at the address: 103982, Moscow, the Center, Ulitsa B. Khmelnitskogo, 3/13, the Commission of the All-Union Komsomol Central Committee for Leninist Komsomol Prizes in Science and Technology. Telephone: 206-85-84, 206-89-08.

U.T. Abdrakhimov, S.U. Dzholdasbekov, B.I. Zhursenbayev, T.T. Kaimov, M.A. Simakov--"The Development and Study of Hoisting and Manipulating Mechanisms of High Classes." Submitted by the Kazakh State University, the Institute of Mathematics and Mechanics of the Kazakh SSR Academy of Sciences.

B.E. Avakov, K.N. Kuliyev--"The Development and Commercial Introduction of New Highly Efficiency Drilling Muds." Submitted by the Moscow Institute of Petroleum and Gas imeni I.M. Gubkin.

L.V. Averyanov--"The Classification and Caryoclassification of Several Species of Orchidaceae." Submitted by the Institute of Botany of the USSR Academy of Sciences.

Yu.N. Agapov, A.V. Barakov, A.V. Sannikov, Yu.D. Dergunov, A.A. Zolotarev, M.V. Kulakov, V.A. Tarasov, A.V. Kuznetsov, V.A. Sotnikov, A.D. Sivorin--"The Scientific Substantiation, Development, and Introduction of Heat Exchange Units for the Recovery of Gaseous Secondary Energy Resources." Submitted by the Moscow Institute of Power Engineering, Voronezh Polytechnical Institute, the Voronezh Elektrosignal Production Association.

M.U. Azenov, I.A. Balabantsev, T. Dzhalilova, M.K. Dzhurayev, I.A. Zaks, D. Makhmuratov, R.A. Nigmatulin, V.V. Khegay, M.A. Yakubov--"The Increase of the Efficiency of Reclamation Systems." Submitted by the Central Asian Scientific Research Institute of Irrigation imeni V.D. Zhurin.

V.Ye. Alabushev, S.V. Bogdanov, G.Yu. Grigorov, B.A. Yerekhinskiy, V.P. Zenyakin, A.V. Konovalov, S.A. Popov, V.N. Teterin, V.I. Udovichenko--"The Development and Introduction of Equipment for the Sealing of Wells Under Water." Submitted by the Volgograd Plant of Drilling Equipment.

A.I. Alekseyev, M.L. Andreyeva, G.A. Guseynov, M.A. Yermachkov, S.Kh. Zhabbarov, L.V. Ivanovskaya, S.P. Maslennikov, S.V. Romanov, A.V. Treshchev, A.Ye. Filimonov--"The Development and Introduction of a Family of Transport Robots With a Microprocessor Control System for Flexible Machine Systems." Submitted by the Zelenogradskiy Rayon All-Union Komsomol Committee of Moscow.

N.V. Andronova, M.V. Zelepukhin, V.F. Pindyurin, A.I. Chechin--"The Coherent Excitation of Mossbauer Nuclei by Intense Synchrotron Radiation." Submitted by the Institute of Atomic Energy imeni I.V. Kurchatov.

A.N. Antonov, A.G. Barabashev, A.V. Surin--"The Philosophical Analysis of the Laws and Trends of the Development of Modern Science." Submitted by Moscow State University imeni M.V. Lomonosov, the Presidium of the Board of the USSR Philosophical Society.

A.S. Akhmanov, A.V. Yevseyev, S.I. Ionov, M.V. Kuzmin, G.A. Polyakov, V.K. Popov, A.A. Stuchebryukhov, N.A. Sukhareva, V.V. Tyakht, A.V. Chugunov--"The Intramolecular Oscillatory Dynamics, Spectroscopy, and Kinetics of Highly Excited Polyatomic Molecules in Gas-Phase Photophysics and Photochemistry." Submitted by the Scientific Research Center for Technological Lasers.

Sh.A. Ayupov, R.Z. Abdullayev, M.A. Berdikulov, O.Ye. Tikhonov, N.V. Trunov, Sh.M. Usmanov--"Research on Operator Algebras and Noncommutative Integration." Submitted by the Institute of Mathematics imeni V.I. Romanovskiy of the Ukrainian SSR Academy of Sciences, Kazan State University.

V.V. Basevich, P.V. Vrzheshch, A.V. Maksimenko, V.V. Mozhayev, A.M. Morozov, M.L. Rabinovich, A.P. Sinitsyn, V.M. Chernoglazov, V.A. Shikshnis--"Immobilized and Stabilized Enzymes for the Purposes of Biotechnology and Medicine." Submitted by the Institute of Biochemistry imeni A.N. Bakh of the USSR Academy of Sciences, the Moscow Institute of the Food Industry.

Yu.V. Belov, O.M. Belokrylova, A.A. Yeremenko, I.V. Zhbanov, S.V. Ivanov, A.V. Koroteyev, T.B. Salova, L.I. Frolova--"The Development and Introduction in

Clinical Practice of a Set of Methods, Which Increase the Effectiveness and Safety of Surgical Operations on Coronary Arteries in Case of Ischemic Heart Disease." Submitted by the All-Union Research Center of Surgery of the USSR Academy of Medical Sciences.

V.V. Belonozhko, V.K. Zhivulin, A.D. Kolosov, V.K. Kuznetsov, A.A. Kuzmichev, A.A. Levochkin, A.V. Litvinov, I.V. Ostapova, V.Ye. Moiseyenko, A.I. Sukhoykin--"The Development and Introduction of Elements of the Software and Hardware Complex of a Flexible Machine System." Submitted by the Energiya Scientific Production Association.

S.Ye. Bender, A.A. Borshchegovskiy, A.N. Vertiporokh, M.P. Gryaznevich, S.A. Yefremov, V.A. Zhuravlev, S.V. Lebedev, A.B. Pimenov, N.V. Sakharov--"The Experimental Study of Physical Processes in the Plasma of Tokamaks." Submitted by the Institute of Atomic Energy, the Physical Technical Institute imeni A.I. Ioffe.

V.L. Bizyayev, N.N. Lukzen, V.I. Melekhov, V.O. Sayk, S.N. Smirnov--"Primary Track Processes in Nonpoplar Solutions With the Involvement of Spin-Correlated Ion Radicals." Submitted by the Institute of Chemical Kinetics and Combustion of the Siberian Department of the USSR Academy of Sciences, Novosibirsk State University.

Ye.V. Blagov, A.I. Buzdin, A.A. Varlamov, A.V. Gurevich, S.S. Ivanov, A.V. Krivykh, N.N. Martovetskiy, S.V. Panyukov, V.V. Ryazanov, M.V. Fistul--"The Superconductivity of Laminated Heterogeneous Systems and Composite Materials." Submitted by the Moscow Institute of Steel and Alloys, the State Committee for the Utilization of Atomic Energy.

N.V. Bliznyuk, V.V. Bredikhin, Ye.A. Didenko, V.V. Kolokhov, V.A. Selezen, S.A. Shcherbak--"The Theoretical Principles of the Technology of the Production of Insulating Composite Silicate Materials." Submitted by the Dnepropetrovsk Institute of Construction Engineering.

I.G. Blinov, S.A. Veremeyenko, V.A. Ilin, A.A. Korshak, N.G. Kocheva, O.Kh. Tarzimanov--"Resource-Saving Methods of the Designing, Construction, and Operation of Pipeline Systems." Submitted by the Bashkir Oblast All-Union Komsomol Committee.

K.A. Borovkov, B.A. Zalesskiy, A.Yu. Rachkauskas, V.V. Ulyanov--"A Series of Works on Limit Theorems of Probability Theory." Submitted by the Institute of Mathematics imeni V.A. Steklov of the USSR Academy of Sciences.

I.B. Bragin, S.P. Levshunov, I.Ye. Manykin, T.R. Meren, V.P. Mkrtchyan, I.I. Nanaziashvili, I.A. Razuvayeva, T.T. Serka, A.A. Filatov, A.D. Fishchenko--"Achievements in the Diagnosis and Treatment of Acute Disorders of Coronary Circulation." Submitted by the Institute of Cardiovascular Surgery imeni A.N. Bakulev, the Moscow Scientific Research Institute of First Aid imeni N.V. Sklifosovskiy, Tallinn City Hospital No 20.

T.P. Burmistrova, V.A. Gorelik, A.N. Rayev, G.M. Samsonova, A.S. Soroka, S.S. Sykhorukov, A.V. Yakovenko--"The Development and Introduction in Industry of

Priority Means of Automated Auger Energy Analysis." Submitted by the Physical Technical Institute imeni A.F. Ioffe of the USSR Academy of Sciences.

A.V. Vavilin, O.A. Godin, A.N. Ivakin, V.Kh. Kiriakov, V.N. Kulakov, L.Ya. Lyubavin, A.A. Ostrovskiy, A.G. Nechayev, A.Yu. Shmelev, I.O. Yaroshchuk--"Theoretical and Experimental Studies of Acoustic Fields in the Ocean." Submitted by the Institute of Oceanology imeni P.P. Shirshov, the Institute of Acoustics imeni N.N. Andreyev.

F.A. Valeyev, N.A. Danilova, V.R. Korits, E.V. Lozha, M.V. Lykhmus, O.V. Parve, O.V. Sakhartova, N.N. Sidorov, A.G. Tolstikov, I.E. Yarving--"Basic and Applied Studies of Prostanoids." Submitted by the Institute of Chemistry of the Bashkir Affiliate of the USSR Academy of Sciences, the Institute of Chemistry of the Estonian SSR Academy of Sciences, the Institute of Organic Synthesis of the Latvian SSR Academy of Sciences.

R.M. Valiyev, S.F. Dedyukhin, M.Yu. Zashlyapin, N.A. Klinskaya, V.I. Petunin, D.V. Ponomarenko, N.I. Ulyashin, A.A. Gostenin--"The Development of the Technology and Materials for the Plasma Application of Wear-Resistant Coatings." Submitted by the Institute of Metallurgy of the Ural Scientific Center of the USSR Academy of Sciences, the Institute of Chemistry of the Ural Scientific Center of the USSR Academy of Sciences.

G.P. Volkov, V.N. Gabitov, A.O. Kudashev, Ye.M. Lesovaya, V.M. Shatunov, B.A. Zhinkin, S.V. Fedosov, P.V. Yakubenko, Yu.A. Menshikh--"The Development of a Hybrid Technology of Superplastic Deformation Which Is Combined With Diffusion Jointing. The Development of Unique Equipment and Accessories." Submitted by the Scientific Research Institute of Technology of Machine Building, the Voronezh Machinery Plant.

A.A. Voloboyev, Yu.V. Gulevich, V.P. Zagorodnikov, G.V. Kudryavtzev, S.A. Panichev, A.B. Ponomarev, Ye.V. Starodubtseva, S.M. Staroverov, M.R. Lutsenko, A.L. Chuvilin--"New Complex Metal Catalysts of Selective Reactions of Organic Compounds." Submitted by the Institute of General and Inorganic Chemistry imeni N.S. Kurnakov of the USSR Academy of Sciences, the Institute of Organic Chemistry imeni N.D. Zelenskiy of the USSR Academy of Sciences, the Scientific Research Institute of Physical Chemistry imeni L.Ya. Karpov.

A.G. Gabibov, A.V. Itkes, O.N. Kartasheva, S.N. Kochetkov, I.V. Smirnov, V.L. Tunitskaya, K.T. Turpayev--"The Physical Chemical and Biological Mechanisms of the Adenosine-3',5'-Cyclophosphate-Dependent Phosphorylation of Proteins." Submitted by the Institute of Molecular Biology of the USSR Academy of Sciences.

A.V. Gerasimov, S.V. Loktayev, S.Kh. Muratov--"The Improvement of the Methods of the Designing of Blade Systems on the Basis of Physical and Mathematical Models of Aerodynamic Processes and the Development of the Blading Sections of Standardized Centrifugal Compressors and Gas Compressor Units." Submitted by Leningrad Polytechnical Institute.

N.G. Gladkaya, D.Yu. Zheldakov--"The Development of a Method of the Removal of Nitrogen Oxides From the Combustion Products of the Heaters of the Primary

Reforming of Methane of Large-Tonnage Ammonia Plants." Submitted by the Moscow Institute of Petroleum and Gas imeni I.M. Gubkin.

S.L. Grishin, D.V. Davydov, O.V. Islanova, Ye.V. Rastorguyeva, N.V. Rostunova, V.G. Smolkov, V.A. Tolmachev, M.Yu. Tolmacheva, A.V. Ugarov, V.B. Chugunov--"The Development and Introduction in Clinical Practice of Medical Information and Computing Systems and Methods of the Intra-Operational Monitoring of the Condition of the Patent in Case of the Performance of Complicated Surgical Interventions." Submitted by the All-Union Research Center of Surgery of the USSR Academy of Medical Sciences, the Scientific Research Institute of Transplantology and Artificial Organs of the USSR Ministry of Health.

V.A. Gusev, V.V. Romanov, V.V. Danilov, V.M. Zhuravkov, S.Yu. Rovinskaya, A.V. Lebedev, Ye.Yu. Tikhomirova--"The Study, Development, and Industrial Introduction of Efficient Means of Increasing the Operating Reliability and Durability of Modern High-Speed Cotton Carding Machines." Submitted by Kostroma Technological Institute.

Ye.K. Davydova, V.B. Minikh, A.S. Sitikov, A.N. Fedorov--"The Compartmentalization of Proteins of the Translation System on Eucaryotic Polyribosomes." Submitted by the Institute of Protein of the USSR Academy of Sciences.

S.D. Dushenkov, A.I. Yerko, A.S. Kramarenko, V.V. Martynov, R.Kh. Makhmutov, A.A. Snigirev, V.A. Kudryashov, A.L. Bogdanov--"The Development of the Principles of New Methods of the Technology of Submicron Structures for Microelectronics, High-Resolution X-Ray Optics, and Spectroscopy." Submitted by the Institute of Problems of the Technology of Microelectronics and Ultrafine Materials of the USSR Academy of Sciences.

N.N. Dyakov--"The Young Algerians and the Anticolonial Struggle in Algeria at the Turn Between the 19th and 20th Centuries." Submitted by Leningrad State University.

V.V. Yermolovich, V.F. Mozgovoy, Yu.A. Maksimchuk, S.I. Pantsev, I.L. Barkan, A.L. Bernshteyn, V.N. Lobachev, G.F. Pashin, A.V. Popov, G.S. Levchinskiy--"A Set of Works in the Area of the Development of a Flexible Technology of the Building of Protective Enclosures of Underground Structures on the Basis of the Geotechnic Monitoring and Control of the Physical Mechanical Properties and State of the Rock Mass." Submitted by the VIOGEM [All-Union Scientific Research Planning and Design Institute on the Reclamation of Fossil Fuel Deposits, Special Mining Operations, Mineral Geology, and Underground Surveying (Belgorod)] of the USSR Ministry of Ferrous Metallurgy.

N.I. Zheludev, R.S. Zadoyan, V.A. Makarov, Yu.P. Svirko--"The Phenomenon of Nonlinear Optical Activity and Its Application in the Spectroscopy of Crystals." Submitted by Moscow State University imeni M.V. Lomonosov.

A.G. Zhiryakov, V.N. Lekanov, I.N. Ulmasova, P.Ye. Khodakov--"The Development of Means and Methods of the Extermination of Insects With Thermal Aerosols." Submitted by the All-Union Scientific Research Institute of Veterinary

Entomology and Arachnology (Tyumen) and the All-Union Scientific Research Institute of Veterinary Sanitation (Moscow).

S.Yu. Ivanova, A.V. Sharanyuk--"The Optimization of Designs in Case of Dynamic Loads." Submitted by the Institute of Problems of Mechanics of the USSR Academy of Sciences.

A.N. Isakulov, R.R. Islamov, Ye.G. Kim, B.G. Nazarov, U.B. Tulepov, U.O. Khalimbetov, A.A. Khudayberdiyev--"The Development and Introduction of a Set of Machines for the Coating of Cotton Seeds, Their Sowing, and the Harvesting and Transportation of Raw Cotton by the Container Method." Submitted by the Central Asian Scientific Research Institute of the Mechanization and Electrification of Agriculture.

V.Yu. Karpov, A.V. Tolstenko--"The Phenomenon of the Anomalous Spontaneous Deformation of Metals." Submitted by the Dnepropetrovsk Metallurgical Institute.

P.L. Kachalov, A.Yu. Lender, Ye.I. Mishchenko, A.P. Nedavniy, A.M. Klochko, P.D. Tikhomirov--"The Development and Study of Optoelectronic Sensors of Linear Displacements for Precision Industrial Measuring Systems." Submitted by the Sistema Scientific Production Association.

G.Kh. Kitayeva, A.A. Malygin, A.V. Sergiyenko--"The Study of the Quantum Properties of the Parametric Scattering of Light and the Development of New Nonlinear Optical Methods of Absolute Quantum Photometry." Submitted by Moscow State University imeni M.V. Lomonosov.

V.N. Kondratyev, V.P. Rudenko, S.V. Chmutov, V.A. Kryukov, Ye.V. Feodoritova--"The Mobile Implementation of the Micro-Prologue System." Submitted by an affiliate of the Institute of Problems of Cybernetics of the USSR Academy of Sciences.

I.I. Kositsyna, Ye.I. Starchenko, N.A. Tereshchenko, N.L. Chernenko, A.N. Makhankov, V.A. Tatarenko, Yu.N. Yagodzinskiy--"Aging Austenitic Alloys With Controllable Stability Are a New Group of High-Strength Materials." Submitted by the Institute of Physics of Metals of the Ural Scientific Center of the USSR Academy of Sciences.

N.G. Kruzhilin--"The Geometry of Real Hypersurfaces of Complex Space and the Description of Their Groups of Automorphisms." Submitted by the Institute of Mathematics imeni V.A. Steklov of the USSR Academy of Sciences.

A.V. Kulik, A.V. Singovskiy, P.M. Shagin--"The Discovery and Study of the G(1590) Mesonan [possible Mesonic] Elementary Particle With the Properties of a Glueball." Submitted by the Institute of High Energy Physics.

Yu.A. Lebedev--"The Development of Load-Bearing Elements and the Study of Their Effect on a Rock Mass." Submitted by Gorno-Altaysk Pedagogical Institute.

V.V. Madison, L.V. Madison, T.N. Surayeva--"The Introduction of the Method of Embryo Transplanation Under the Conditions of Operating Agricultural Production of the Zarya kommunizma State Pedigreed Stock Farm." Submitted by the Zarya kommunizma State Pedigreed Stock Farm of Moscow Oblast.

A.O. Mazarovich, S.V. Rasskazov--"Regional Geological Studies of Eastern Siberia and the Far East." Submitted by the Institute of Geology of the USSR Academy of Sciences, the Institute of the Earth's Crust of the Siberian Department of the USSR Academy of Sciences.

Yu.M. Makeyenko, M.I. Polikarpov--"Universality in Screen Calibration Theories and Its Use in Case of Numerical Calculations." Submitted by the Institute of Thermal and Experimental Physics.

S.V. Mitrokhin, V.S. Zontov, S.N. Klyamkin, S.I. Kuliyev, A.N. Sytnikov--"The Development and Production of Highly Efficient Metal Hydride Hydrogen Tanks." Submitted by Moscow State University imeni M.V. Lomonosov.

T.N. Morozova, Ye.B. Zhdanova, T.A. Ledik, L.V. Ogurtsova, A.S. Kareva, M.P. Grishina--"A Method of the Elimination of Petroleum Contaminants of Water and Soil." Submitted by the Western Siberian Scientific Research Institute of the Geological Prospecting for Petroleum.

V.N. Nizov, N.N. Nizova, O.V. Khayt--"Cryoultrasonic and Cryoendoscopic Methods of the Diagnosis and Treatment of Hyperplastic Processes of the Uterus." Submitted by the Odessa Medical Institute imeni N.I. Pirogov.

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CSO: 1814/239

IMPROVEMENT OF WORK OF SECTORIAL RESEARCH, DESIGN ORGANS

Moscow PRAVDA in Russian 19 Jul 86 p 1

[Article: "To Leading Levels"]

[Text] The policy of the acceleration of scientific and technical progress, the decisive updating of the equipment and technology of production, and the increase of its efficiency and product quality is the general line of the party and the basis of the further upswing of the economy of the country. It is quite natural that a significant share of the responsibility for the strict observance of this policy falls to the thousands of sectorial scientific research, planning, and design organizations and the engineering services of enterprises.

The organizations, which already today serve as an example of the realized, efficient fulfillment of the tasks facing them and of work at the level of genuine innovation, which enables them to hold vanguard positions in the corresponding directions of science, technology, and production, are well known. These are the Kriogenmash Scientific Production Association, the Uralmash Association with its research and engineering subdivisions, the Central Aerohydrodynamics Institute (TsAGI), the Moscow Scientific Research Institute of Eye Microsurgery, and a number of others. Their theoretical and practical developments are being embodied and are fruitfully influencing the increase of the efficiency of the "treated" sectors.

At the same time far from all sectorial scientific research institutes and design bureaus are holding an active position in the development of new types of highly productive equipment and advanced technological processes and materials and in the increase of product quality. Recently the USSR Council of Ministers adopted the decree "On Serious Shortcomings in the Activity of Several Sectorial and Planning and Design Organizations." It is noted that the work of some is inefficient, is not of a creative nature, and does not have an appreciable influence on the increase of the technical level of production, while at times it is not at all of either scientific or practical value. It was decided to eliminate two such institutes--the All-Union Scientific Research, Planning, and Design Institute for Complete Technological Lines of the Ministry of Chemical and Petroleum Machine Building and the GiproNIImash [State Planning and Scientific Research Institute for Machine Design] of the Ministry of the Machine Tool and Tool Building Industry. The

work of a number of other institutes was also recognized as fruitless scientifically and as not satisfying the present requirements of scientific and technical progress.

Ministries and departments bear a certain portion of the blame for this. Precisely they are responsible for the development of sectorial science and for its level and practical return. However, many of them are inclined to regard their research subdivisions as a certain continuation of the management staff, keeping them busy with assignments which have nothing to do with creative work. Accordingly, the accountability for the level of developments is also weakening. It happens that several ministries themselves are turning into centers of opposition to advanced ideas and directions.

For example, the ever increasing importance of plastic metal working, which decreases production waste, is well known. In two decrees of the CPSU Central Committee and the USSR Council of Ministers--of 18 February 1980 and 7 August 1985--there were prescribed for the Ministry of the Machine Tool and Tool Building Industry, under the jurisdiction of which the subsector of forge and press equipment is, specific steps of its development and the assimilation of advanced types of machines. The forces of scientific research and planning and design subdivisions and engineering services of enterprises had to be mobilized for the unquestioning fulfillment of the assignments. Instead of this the ministry began to seek in every way their postponement to later dates, which it succeeded in doing. As a result a large portion of the assignments, as, incidentally, the plan of the production and deliveries of forge and press machines as a whole proved to be unfulfilled. Such are the fruits of the chronic underestimation of this subsector by the ministry. The intervention of the Party Control Committee attached to the CPSU Central Committee was needed in order for the requirements of state discipline to triumph.

Several other sectorial organs of management should also tie this "string around their finger." How many different decisions and orders over the course of many years have been adopted, say, on the organization of the production of polypropylene film, which is necessary for the production of more advanced electrical items. Quite a number of scientific and technical institutions, which given certain efforts could have solved this problem long ago, are under the jurisdiction of the Ministry of the Chemical Industry. However, the ministry invariably refused to have anything to do with the fulfillment of the assignment, giving as a reason the difficulties of the organization of the production of the film and putting its trust in foreign deliveries.

The attitude at research and planning and design subdivisions, ministries, and departments toward innovators characterizes in many respects the concern for the acceleration of scientific and technical progress. At the June (1986) CPSU Central Committee Plenum it was noted that now it is especially necessary to appreciate people with an innovative mind. Unfortunately, to this day one still has occasion to encounter cases, when creative people and authors of effective developments are persecuted either at their own organizations or in the ministries, or else in both places. The reversals of the fortune of the vortex vessel--a reactor which makes it possible to speed up by many fold various technological processes--were recently told about in PRAVDA. The

series production of the vessel was organized, it also justified itself in practice. However, ill-wishers were able to defame the inventor and to censure his development, as a result the Ministry of Chemical and Petroleum Machine Building halted the production of the item. True, now it has been decided to restore its production. A similar thing happened in the Ministry of the Electrical Equipment Industry, the USSR Ministry of the Construction Materials Industry, and several other ministries. And, what is especially intolerable, with the direct connivance of the party committees of these organs of management. But precisely party organizations are called upon to take care of the education and support of resourceful creative personnel and not to allow their reduction to the level of faceless copiers of what is known.

Today this is especially important. For the time, when it was possible to be content with the development of plans, designs, and technological processes, which correspond to the best world examples, has passed. For when it comes to the embodiment of these developments, the best world examples will already be different. It is necessary not to catch up with the already known level of equipment, but to surpass it with respect to all the most important parameters. The guarantee of success lies in this and only this. The creative, innovative work of all scientific research institutes and design bureaus is necessary. Ministries and departments should aim their scientific and technical subdivisions at this.

In the decree "On the All-Union Socialist Competition for the Successful Fulfillment of the Assignments of the 12th Five-Year Plan" the CPSU Central Committee, the USSR Council of Ministers, the All-Union Central Council of Trade Unions, and the All-Union Komsomol Central Committee call upon the collectives of scientific research, planning, and design organizations to concentrate efforts on the development of equipment of new generations, effective technological and design solutions, and highly productive strains of agricultural crops and breeds of animals, on the achievement in these areas of leading positions in the world, and on the shortening of the time of the introduction of developments in production.

Thus, the leading positions in the world in the most important directions of scientific and technical progress--such are the goals and tasks which face scientific research and planning and design organizations during the five-year plan which has started. These leading levels should be attained.

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BIOGRAPHICAL INFORMATION

LEV ALEKSANDROVICH MELENTYEV OBITUARY

Moscow IZVESTIYA in Russian 12 Jul 86 p 6

[Article: "Academician Lev Aleksandrovich Melentyev"]

[Text] Soviet science has suffered a great loss. On 8 July 1986 Academician Lev Aleksandrovich Melentyev, an outstanding Soviet scientist in the field of power engineering, a CPSU member, a member of the Presidium of the USSR Academy of Sciences, director of the institute of power engineering research of the USSR Academy of Sciences and the State Committee for Science and Technology, and Hero of Socialist Labor, died at the age of 77.

L.A. Melentyev was born on 9 December 1908 in Leningrad. After graduating in 1930 from Leningrad Polytechnical Institute he worked as a power engineer and made a large contribution to the development of the power engineering services of Leningrad. In 1960 he was elected a corresponding member and in 1966 a full member of the USSR Academy of Sciences.

When the task of establishing a large scientific center in the eastern part of the country was posed, Academician L.A. Melentyev was in charge in Irkutsk of the Presidium of the East Siberian Affiliate of the Siberian Department of the USSR Academy of Sciences and invested much effort and energy in the establishment of the Siberian Power Engineering Institute, which he managed until 1973. In subsequent years L.A. Melentyev managed a department of the Institute of High Temperatures of the USSR Academy of Sciences, the Scientific Council of the USSR Academy of Sciences for Complex Problems of Power Engineering, and a problem commission of the multilateral cooperation of the academies of sciences of the socialist countries in the field of physical technical problems of power engineering and was deputy academician secretary of the Physical Technical Problems of Power Engineering Department of the USSR Academy of Sciences.

The scientific activity of L.A. Melentyev was devoted to the solution of the most difficult and important problems of the fuel and power complex of the country and to the development of the theoretical principles of systems research in power engineering. Major achievements in the field of the optimization of large power systems are connected with his name.

The services of L.A. Melentyev were appreciated by the Communist Party and the Soviet state. The lofty title of Hero of Socialist Labor was conferred on him. He was awarded four Orders of Lenin, the Order of the October Revolution, the Order of Labor Red Banner, the Badge of Honor, and medals.

The blessed memory of Lev Aleksandrovich Melentyev, a talented scientist and a modest and benevolent man, who devoted his entire life to service to the homeland and the development of Soviet science, will remain forever in our hearts.

[Signed] G.A. Aliyev, V.I. Vorotnikov, Ye.K. Ligachev, V.I. Dolgikh, B.N. Yeltsin, M.V. Zimyanim, A.P. Aleksandrov, G.I. Marchuk, B.Ye. Shcherbina, V.A. Kotelnikov, P.N. Fedoseyev, Ye.P. Velikhov, V.A. Koptyug, A.A. Logunov, Yu.A. Ovchinnikov, K.V. Frolov, A.L. Yanshin, V.A. Grigoryev, G.K. Skryabin, V.M. Velichko, V.A. Dinkov, A.I. Mayorets, V.S. Chernomyrdin, M.I. Shchadov, V.A. Kirillin, I.A. Glebov, K.S. Demirchyan, M.A. Styrikovich, A.Ye. Sheyndlin, N.K. Baybakov, A.A. Marakov

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